SEPTEMBER 1950

Plant Engineering

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Volume 4, No. 9 Circulation of this issue 30,610

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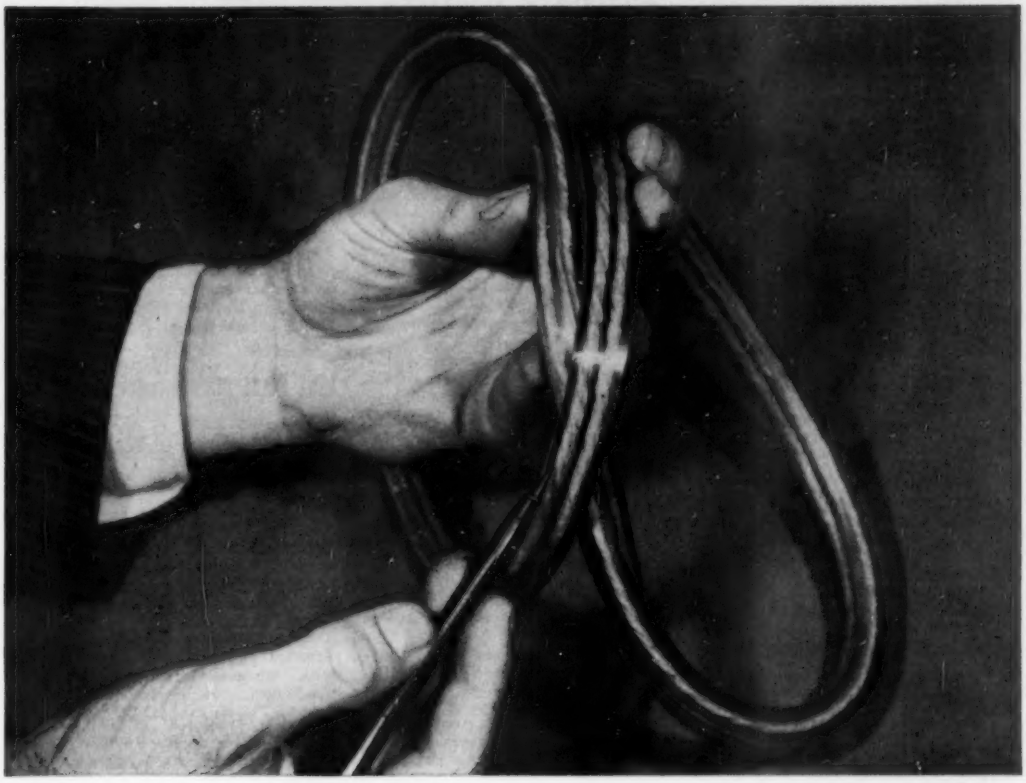

"X-ray" of a grommet V belt— the belt that lasts 20 to 50% longer

Twin grommets found only in B. F. Goodrich V belts

YOU have to look inside a V belt to to see what gives you more belt service for your money. BFG engineers developed this "X-ray" demonstrator to show you the B. F. Goodrich grommet construction. A "belt" was made of a transparent, flexible material just so you can see the grommets.

Note the twin grommets—The two endless loops are grommets, the load-carrying section of the B. F. Goodrich grommet V belt. They're not ordinary cables, but are made by winding heavy cord on itself to make them endless.

All cords work—Placed close to the driving faces of the belt, grommets keep working close to the driving surfaces. This concentrates cord strength, all cords work, no cords overwork, the load is evenly distributed. In laboratory tests, B. F. Goodrich grommet V belts actually lasted 20 to 50% longer.

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PLANT ENGINEERING

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Subscription Information — Published Monthly. Prices: United States and Possessions one year $10.00, Canada one year $11.00. Other countries one year $12.00. Single copies $1.00.

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'ROUND ABOUT with the editors in field and office

Personal Notes of Plant Engineers

Axel Johnson is now plant engineer of the Hughes Aircraft Co., Culver City, Calif. **Harold Swanson,** maintenance superintendent of the same plant, recently dedicated a new maintenance building centrally located in the facility but separate from the other buildings. **John Stearns,** former plant engineer, is on a special assignment on the staff of the General Manager.

Recently **A. M. Frost,** assistant plant engineer of the Douglas Aircraft Co., Inc., Santa Monica, Calif., became plant engineer. **F. E. Keuhner,** former plant engineer, is now in the research and development work with the same company.

A. E. Roeske, plant engineer of the International Minerals & Chemical Corp., at San Jose, Calif., an old sugar-mill engineer, is known throughout his present company as the "Bowling Ball Engineer." He acquired this reputation after using a standard bowling ball to fashion a non-corrosive ball valve in an emergency.

R. P. Kujawski was recently appointed plant engineer of the Waukesha Motor Co., Waukesha, Wis. The former plant engineer, **H. A. Harmon,** resigned to start a Plant Engineering Service specializing in providing experienced part time engineering service for small industries without a full time plant engineer, or, to larger industries requiring specialized engineering service. Mr. Harmon's address is 306 E. Main St., Waukesha, Wis.

Svante Eikrem, plant engineer of the Hyster Co. at Portland, Ore., recently completed conversion of his electric distribution system from 220 to 440 volts. **Fay Brainard,** former plant engineer, is now Assistant General Manager.

1951 Plant Maintenance Show Set for Cleveland in January

THE PLANT MAINTENANCE Show which drew industrial executives from 35 states and several foreign countries when it was conducted for the first time last January, will be held next January 15 to 18 inclusive. According to Clapp & Poliak, Exposition Management, the coming show will be two to three times the size of the 1950 edition.

Also to be repeated will be the Plant Maintenance Conference which attracted approximately 1,500 attendance. Advance registration cards and hotel information may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

A PE Veteran Emphasizes—Good Maintenance is a Business Asset

MY INTEREST continues in your forum Should Maintenance by Contract be Encouraged. The third series of these articles appeared in the January 1950 issue. The article by A. Levine (page 43) mentions tools, including specialized tools, and placed emphasis on their cost, their infrequent use, and their unavailability in many plants.

For more than 35 yr I have been in the field of plant engineering and always in large industry. I grew up into this responsibility in the steam power plant field in the days when stationary engineering was somewhat of a profession, not just a job, and have been associated with plant and plant equipment maintenance almost 50 yr.

In all this time I have never known plant engineers, under whose supervision I have worked, to use or tolerate inadequate or improper tools or equipment. When I came into this responsibility myself, I made it my business to buy the best tools and equipment available for our workmen. I have never known a management to refuse or condemn this policy.

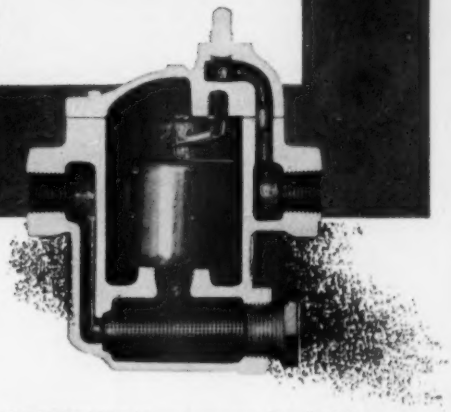
Of course, I can accept as a possibility that there may be so-called plant engineers employed by management who look upon maintenance as a necessary evil, but I believe that these cases are or constitute a very low percentage. In all my experience I have never been required by management to labor with inadequate tools or equipment. Furthermore, I believe that management and business today senses the fact that a plant engineer who wants to, or is willing to, heckle his way along with poor tools is not a real plant engineer.

My experience leads me to the conclusion that management looks upon a plant engineer as one of the biggest assets the plant can have. They depend upon him from experience, knowledge and ability to use the best known methods and the best known tools so that his workmen can keep the plant and equipment in the best possible working condition at the lowest possible cost. Results less than these are not satisfactory to management. Neither would any self-respecting engineer be satisfied with less himself. *Harry W. Benton, PE, Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.*

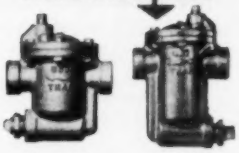
Money Saving Steam Traps with the Strainers *Built Right In*

. . . Now Available in *Two Sizes*

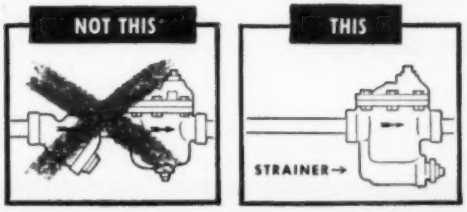
FIRST—THE ARMSTRONG No. 880
AND NOW—THE LARGER No. 881



VITAL STATISTICS



	No. 880	No. 881
Pipe Connections	½" or ¾"	½" or ¾"
Operating Pressure	150 psig	250 psig
Capacity, lbs. per hour continuous discharge	450-690	760-1060
Height	5⅞"	7¼"
Diameter	5"	5"
Weight	5 lbs.	6 lbs.



AN ECONOMICAL steam trap for draining small equipment naturally has a small discharge orifice. When dirt or scale conditions are bad it is recommended that a strainer be installed ahead of such a trap to avoid clogging.

Either the Armstrong No. 880 or No. 881 trap is a perfect answer for such a condition. In each the strainer is built right into the body, thereby eliminating a separate strainer, extra fittings and considerable installation labor. Best of all, these traps cost less than a standard trap plus a separate strainer. Look over your small trap applications and order the traps you need now from your local Armstrong representative's stock.

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ARMSTRONG STEAM TRAPS

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The cost of maintaining your electrical equipment is more than just the first cost of the repair job and the parts. It includes all your expenses of maintaining continuous production.

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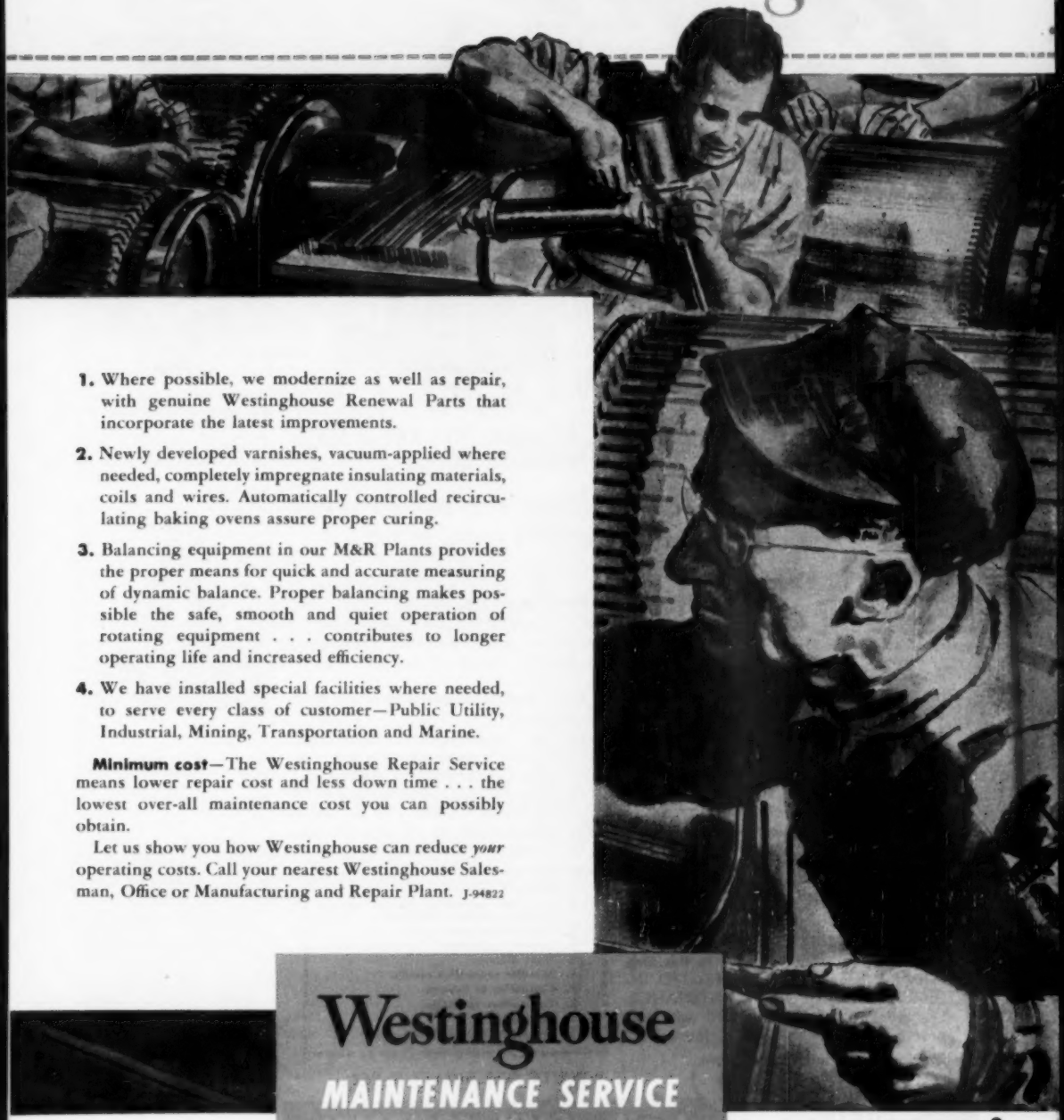

1. Where possible, we modernize as well as repair, with genuine Westinghouse Renewal Parts that incorporate the latest improvements.
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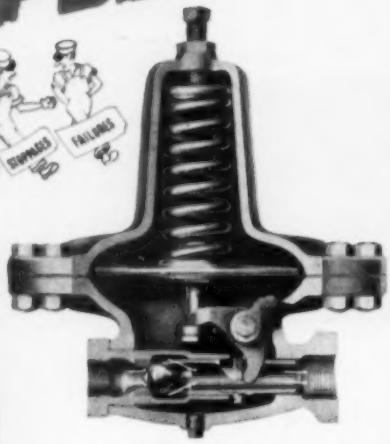
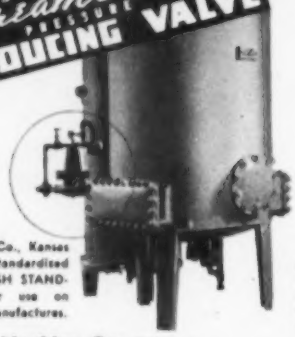
IN THEIR TRACKS BY THE

CASH STANDARD *Streamlined* PRESSURE **REDUCING VALVE** TYPE 1000





The Butler Mfg. Co., Kansas City, Mo. has standardized for years on CASH STANDARD valves for use on vacuum stills it manufactures.

THE USERS TELL WHY IN STATEMENTS BELOW . . .

Check what they say against the 10 points we list . . . . .

An Ice Machine Co. says—
"The streamlined '1000' pressure reducing valves that we have installed on ammonia liquid lines to INSURE UNIFORM PRESSURE at the expansion valves have proven very satisfactory."

A Manufacturing Corp. says—
"We have not had an opportunity to check capacity or cost savings but are pleased with the SMOOTH OPERATION in reducing from 140 psi to 4 or 5 psi."

A Products Co. says—
"Our '1000' unit has been in use about 20 hours daily for about 2 years. In this time there has been NO FAILURES—NO INTERRUPTIONS and NO MAINTENANCE. We reduce from 100# to 20# and have practically forgotten we had the valve."

A Metallizing Co. says—
"ACCURATE PRESSURE CONTROL is vital to our operations. Your '1000' valve has given us very good service."

A Corn and Soybean Products Mfg. Co. says—
"From our experience the type '1000' reducing valve is an excellent direct operated type valve. GOOD PRESSURE CONTROL, TIGHT CLOSURE, and LOW MAINTENANCE COSTS are all factors which influenced us to use a good many of these valves in our plant."

1. Maximum capacity when needed most.
2. Accurate pressure control under toughest working conditions.
3. Trouble-free service.
4. Smooth operation.
5. Tight closure.
6. Speedier production results.
7. Elimination of failures.
8. Cost-saving operation.
9. No spoilage.
10. Practically zero in maintenance.

• WRITE FOR BULLETIN 962

CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

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BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES

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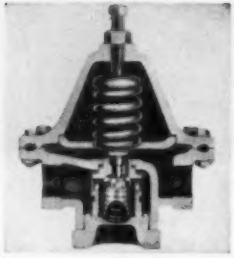
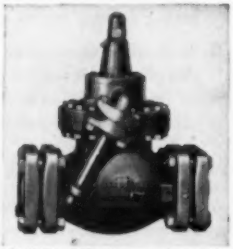
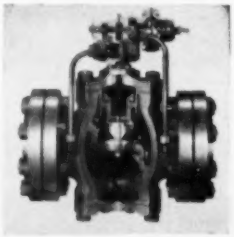


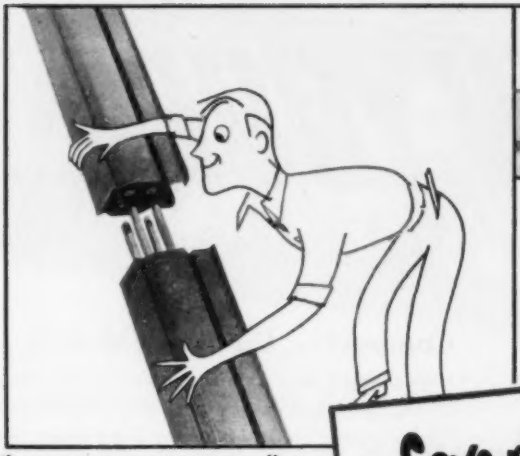
Bulletin 950—features the CASH STANDARD Type B Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.



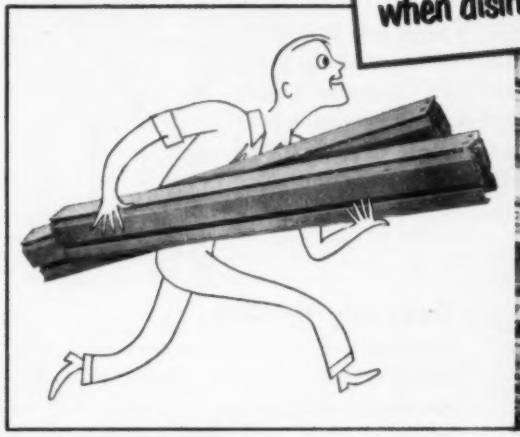
Save money these 3 ways when distributing power

"Quick-install-ability" saves initial cost

LTG FLEX-A-POWER busways are pre-fabricated housings which are easily coupled in any arrangement and in runs of any required length. Time for installing is much less than for wiring and conduit.

"Plug-in-ability" saves time relocating machines

Take-off plugs or trolley can be inserted anywhere (no drop-out section needed for trolley). You can add or relocate loads without rewiring expense and without long extensions.



"Take-apart-ability" saves material expense

Whenever a *major* relocation of outlets is required, the entire FLEX-A-POWER system can be dismantled, removed to another location and re-installed with practically 100% re-use of materials.

Sealed Power Corp.
saves with Flex-a-Power

LTG FLEX-A-POWER, one of six forms of FLEX-A-POWER for various services from main breakers to individual loads, is designed for light-duty lighting, small tools, appliances. Write for Bulletin TEC-3, THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

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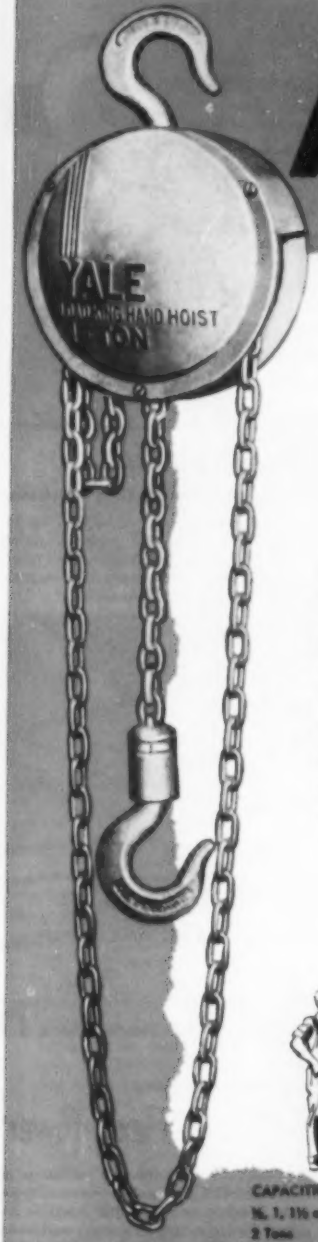
NOW YOURS...

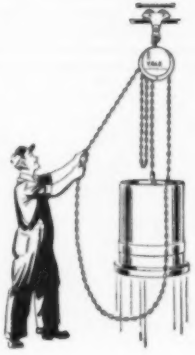


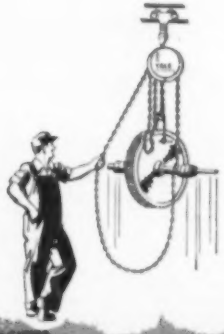
Compact... Lightweight

High strength aluminum alloy castings and alloy steels, fewer parts—these factors provide the "carry-around" lightness of the Load King. The ½-ton model weighs only 37 lbs.! Larger capacities likewise provide unusual lightness for moving the hoist job-to-job in a hurry.

Greater Efficiency

Efficiency up to 95%! It takes only 20 seconds to lift a 1000 lb. load 3 feet. In a minute, 2 tons can be lifted 2.1 feet. Such fast performance is due to minimized friction: *all* rotating shafts have ball bearings, parts are precision machined, and the powerful, revolutionary new Synchro-matic acts quick as a wink.





Easy on Muscles

One-half or 2-ton capacity—the Load King is a one-man hoist! Hand pull force necessary to lift the load is maintained at minimum by its high efficiency. Load King operators save energy, feel better, get more work done per hour. Hoisting costs drop.

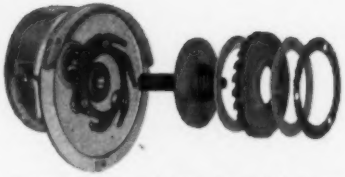
CAPACITIES
½, 1, 1½ and
2 Tons

YALE
TOOLS THAT KEEP
INDUSTRY "ON THE MOVE"

SCALES — Industrial • HOISTS — Hand and Electric • TRUCKS — Hand Lift • Electric • Gasoline • Diesel

YALE LOAD KING HAND HOIST

...the New Lightweight Hoist with the Revolutionary Synchro-matic Load Brake and every other Performance Feature You Want



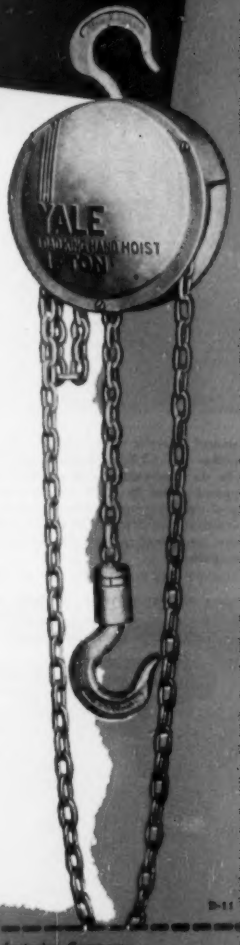
You want a compact hand hoist that's easy to move around. You want greater hoisting efficiency to speed production. You want a hoist that doesn't leave the operator droopy and dragged out after a few lifts. You want all these performance features without any skimpiness in quality and durability.

The Yale Load King Hand Hoist gives them to you—and more! For only the Load King employs the new, improved principle of instantaneous brake action provided in the Synchro-matic load brake. Maximum braking power, automatically! A 6-tooth pawl engages a 24-tooth ratchet at 6 points simultaneously with balanced and cushioned spring pressure . . . no side pressure on bearing surfaces . . . longer pawl life. Furthermore, a stabilizer ring gives a soft, even and lighter hand chain pull — speeds brake release for precise inching when lowering a load.

The Load King is a lightweight, powerful, easy-to-use hoist that's really tough—and safe. It has the same rugged stamina that has made Yale Hoists the first choice of industry for more than three generations. Precision engineering, the finest materials, machining to close tolerances, careful tests and inspections — all make the Load King the hoist you can trust to pay off big.

GET ALL THE FACTS

Now is the time to learn all about the new Yale Load King — its powerful Synchro-matic hoisting performance—its attention-free reliability—its enduring quality. Complete information is yours on request. Ask for Bulletin P-1254. Do it today.



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MAIL THE COUPON TO HEADQUARTERS
for Bulletin P-1254 and the name of the Yale distributor near you.

WORLD-WIDE
YALE HOIST
SALES and SERVICE
Available Through
Your Distributor

THE YALE & TOWNE MANUFACTURING CO
Roosevelt Boulevard Philadelphia 15, Pa.

YALE

The Yale & Towne Manufacturing Company
Department D-90
Roosevelt Blvd. and Haldeman Ave., Philadelphia 15, Pa.

☐ Send me Load King Hand Hoist Bulletin P-1254.
☐ Give me the name of the nearby Yale distributor.

Name .....
Company .....
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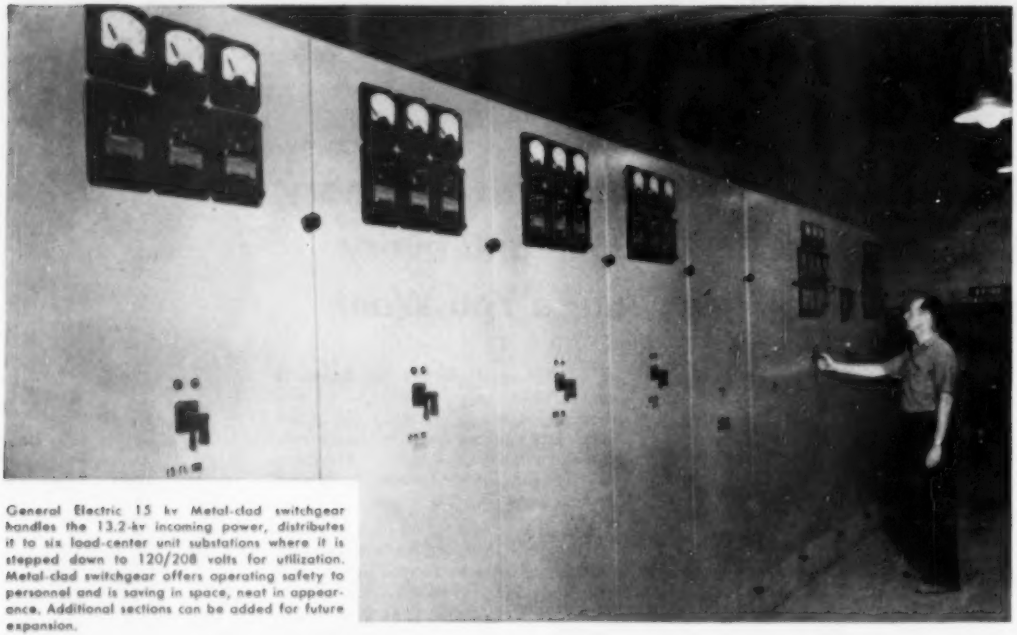
City and Zone ..... State .....

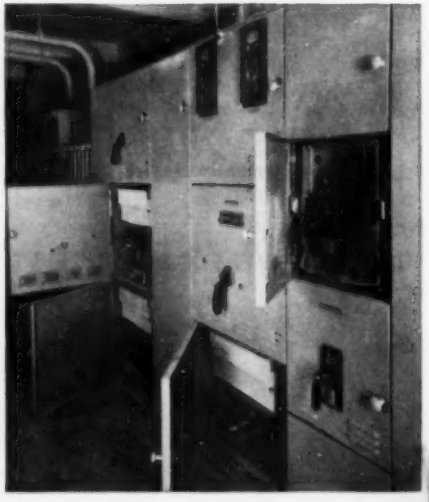
D-11

METAL CLAD SWITCHGEAR



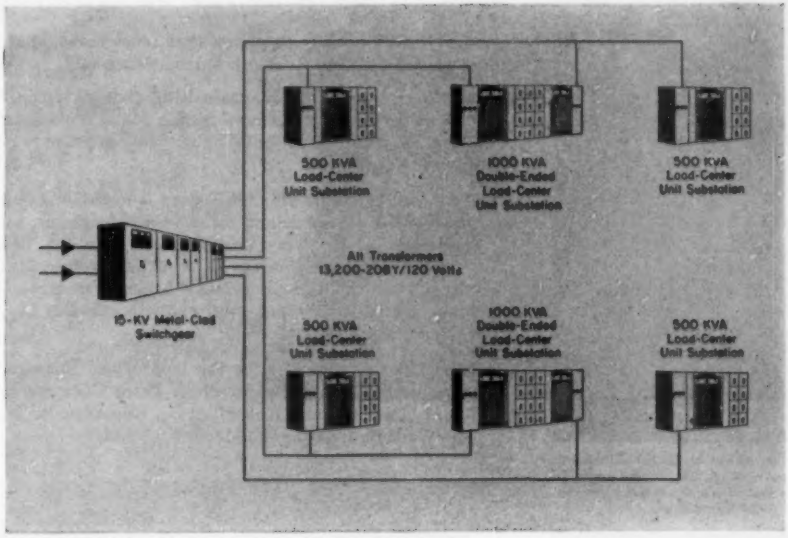
General Electric 15 kv Metal-clad switchgear handles the 13.2-kv incoming power, distributes it to six load-center unit substations where it is stepped down to 120/208 volts for utilization. Metal-clad switchgear offers operating safety to personnel and is saving in space, neat in appearance. Additional sections can be added for future expansion.

Load-center unit substations receive 13.2 kv power and step it down to 120/208 volts for utilization. Air switches on primary are easy to operate, blades are easy to see. Note entire load-center is metal-enclosed thus offering operating safety to personnel.



Low-voltage end of load-center unit substation showing air circuit breakers that have plenty of "IC" (Interrupting Capacity) to handle all short circuits. Breakers are of the drawout type, easily removable for inspection or maintenance.

HELPS PROTECT SERVICE AT TELEPHONE COMPANY INSTALLATION



In this installation General Electric Metal-clad switchgear receives the incoming 13.2 kv power and distributes it to six G-E load-center unit substations. Three load-centers, two single-ended units rated 500 kva and one double-ended rated 1000 kva, are located in the basement. Three other units of identical rating are on an upper floor. From these load-centers utilization circuits feed 208/120-volt power both upwards and down, and provide efficient, low-cost power at constant voltage wherever desired.

This installation is a complete General Electric project —one source of responsibility plus the very best in coordinated planning, engineering, manufacturing, and service facilities to give maximum savings and efficiency to the customer.

Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

MODERN INDUSTRIAL power distribution systems using G-E switchgear are applicable to any industrial plant or commercial building where you want proper voltage for top performance of equipment, an extremely flexible setup to take care of expanding or changing loads, adequate short circuit protection, safety to personnel, and low installation and maintenance costs.

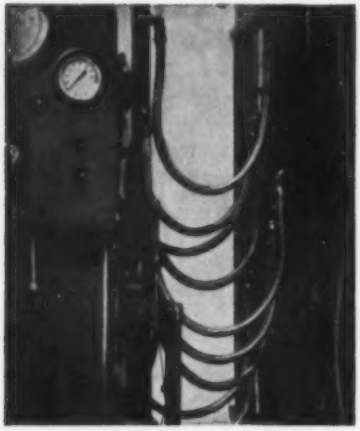
INVESTIGATE TODAY the many advantages of using General Electric switchgear in *your* plant for efficient, flexible power distribution. Contact your G-E sales representative for further information—or write for the helpful bulletins listed below. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GEA-3083 Metal-clad Switchgear
GEA-4966 Low-voltage Metal-enclosed Switchgear
GEA-3592 Load-center Unit Substations
GEA-3758 Load-center Power Distribution

GENERAL ELECTRIC

660-40

make it **flexible** and pressureproof



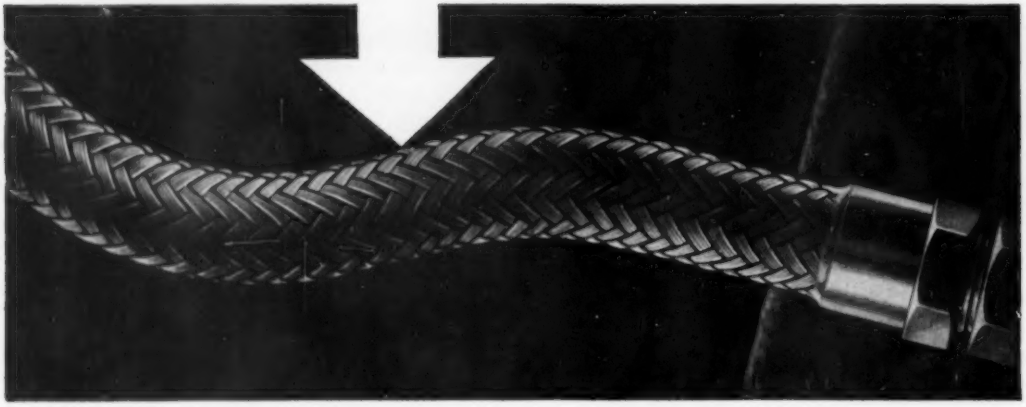
Steam to the moving platens of this hot plate press, made by Williams, White & Co., of Moline, Ill., is carried through these ½" I. D. Bronze American Seamless Flexible Metal Connectors.

Are you plagued with piping that must move, that vibrates, or has connections that are out of alignment?

Whether it carries fluids, gases, semisolids or steam, there's a type of American *Seamless* Flexible Metal Tubing or Flexible Metal Hose to do the job. Neither heat, pressure nor corrosion presents a problem.

American Seamless Flexible Tubing is made of seamless corrugated tubes of bronze and other workable metals, in standard sizes from $\frac{1}{8}$" up. They are reinforced with one, two or three pressure-resistant coverings of wire braid. American Flexible Metal Hose is made of spirally wound continuous strips of brass, bronze, aluminum, steel and other metals in $\frac{1}{8}$" to 12" I. D. sizes.

For illustrated literature, or the help of our Technical Department, just address The American Brass Company, American Metal Hose Branch, Waterbury 88, Connecticut. In Canada, The Canadian Fairbanks-Morse Co., Ltd.

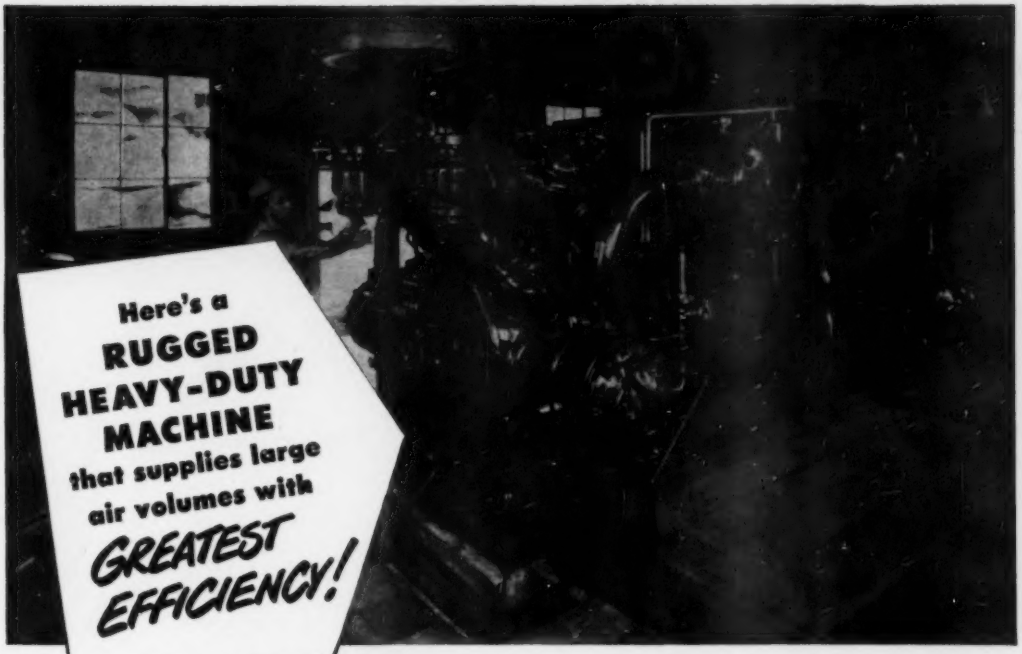


wherever connectors must **move**

ANACONDA

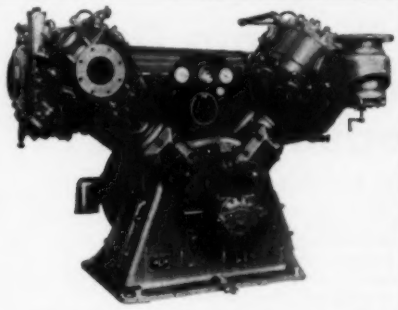
American

FLEXIBLE METAL HOSE AND TUBING



Here's a
RUGGED HEAVY-DUTY MACHINE
that supplies large air volumes with
GREATEST EFFICIENCY!

JOY WN-114 AIR COMPRESSOR



The JOY WN-112 is a two-cylinder, heavy-duty, continuous type unit, having all the features of the WN-114. It delivers 368 to 1828 CFM, up to 3656 CFM in twin units.

Check these Features:

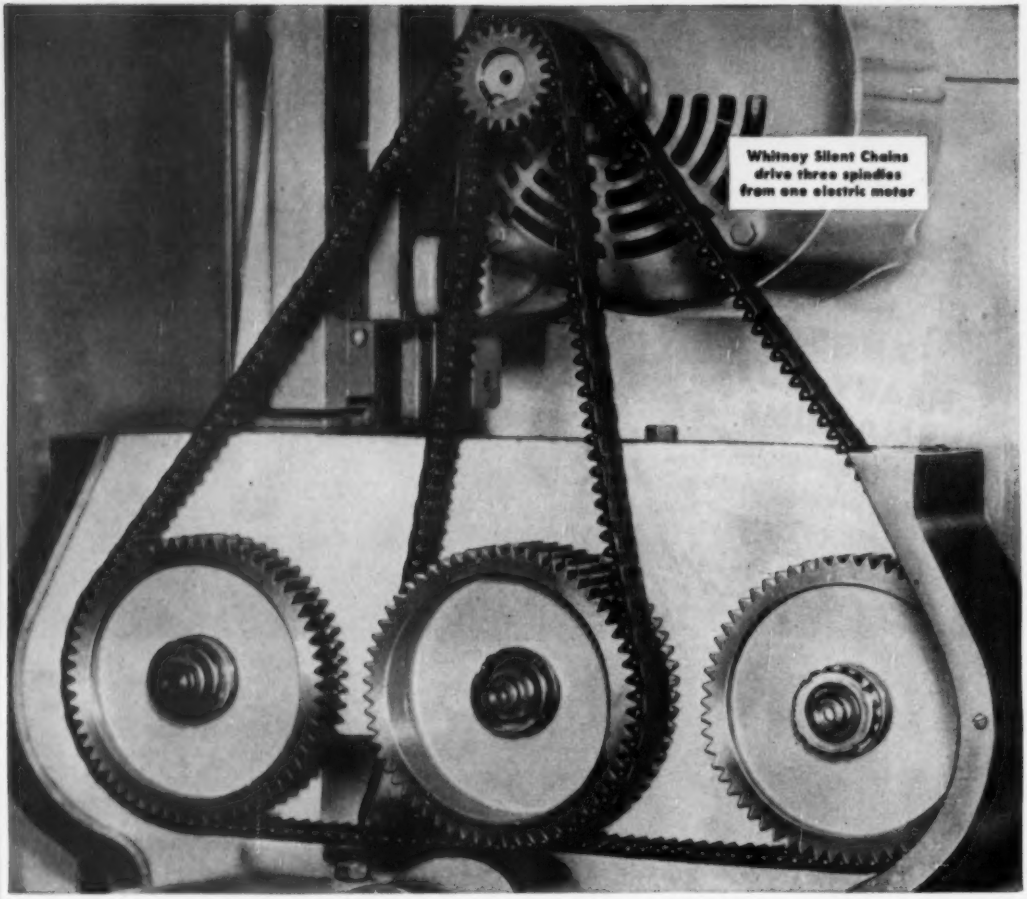
- Delivers 1092 to 3656 CFM, up to 7312 CFM in twin units
- Four Cylinders, two stage, double acting, water cooled
- Requires less room, costs less to install
- Exclusive Dual Cushion Valves are more efficient, have longer service life
- Exclusive Load Control assures lower operating costs
- Simpler design—Longer life—Less maintenance

WRITE FOR BULLETINS, OR

Consult a Joy Engineer

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

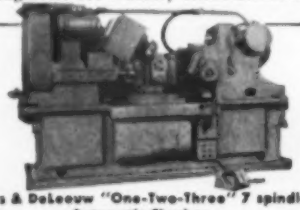


Positive Grip of WHITNEY Chain Drives Cuts Drive Maintenance Costs Delivers Full Rated Machine Output

Goss & DeLeeuw Chuckers Maintain Product Uniformity

This new "One-Two-Three" 7 spindle automatic chucking machine increases production on all classes of work requiring machine and threading operations on one, two or three ends. Due to the simple tooling arrangement and ease of set-up, the chucker is particularly adaptable to short runs.

To assure positive power transmission on heavy work, Goss & DeLeeuw engineers use Whitney Silent Chains to drive the three main spindles from one electric motor. Their experience proves that Whitney Silent Chains transmit full rated horsepower without friction or slippage. This means constant machine output is maintained... highest transmission efficiency is always obtained. And because they are constructed of hardened alloy steel parts, Whitney Silent Chains assure long life under severe operating conditions. It will pay you to investigate Whitney Silent Chain Drives for your products.



Goss & DeLeeuw "One-Two-Three" 7 spindle Automatic Chucker

Whitney products are readily available through a nationwide network of Whitney Distributors and Warehouses. Call the one nearest you for prompt service. For engineering assistance and catalogs, write:

WHITNEY CHAIN COMPANY

232 HAMILTON STREET, HARTFORD 2, CONN.

CROCKER-WHEELER

protected type

POLYPHASE MOTORS

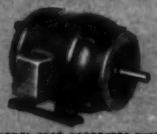
Since 1888 — First Choice for Dollar Saving Design

FOR ALL TYPES OF MOUNTINGS

SQUIRREL-CAGE PROTECTED-TYPE
Form 8A
NEMA D Flange Mounting-Horizontal

SQUIRREL-CAGE PROTECTED-TYPE
Form 8A
NEMA D Flange Mounting Vertical

Widely used for machine tool applications, the NEMA Type D Flange Mounting is available horizontal or vertical with round frames or with feet. Either motor can also be furnished with D flange mounting. 40C rise continuous duty.



SQUIRREL-CAGE PROTECTED-TYPE
Form 8A

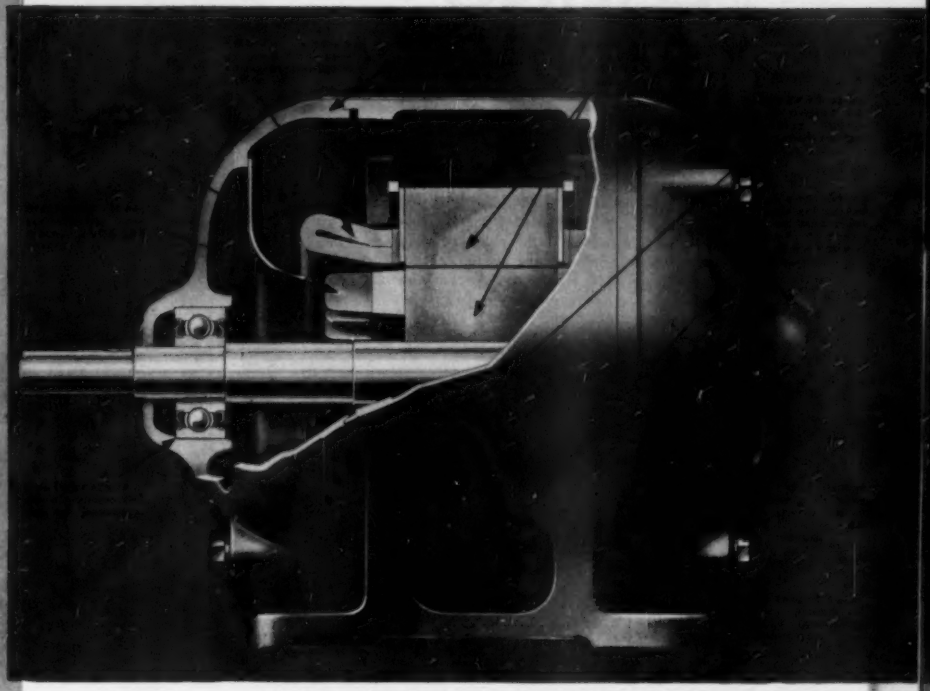
NEMA C Face Mounting. Designed for close coupled pump duty and similar applications. Supplied for either horizontal or vertical operation. 40C rise continuous duty.

SQUIRREL-CAGE SPLASH PROOF
Form 8A

Corrosion-resistant covers prevent splashing liquids from reaching the inside of the motor. 50C rise continuous duty.

The New C-W BRAKE MOTOR
for Protected-type drives

The Crocker-Wheeler Brake can be mounted on appropriate NEMA D flange or C face motor with suitable double shaft extension. Simple, wrap-around cover on Brake gives totally-enclosed protection. The resulting Brake Motor is exceptionally compact for mounting in limited space. The bonded metal brake linings, the torque elements close to mounting flange, the large diameter spline with many teeth, and other exclusive features make the C-W Brake unequalled for complete dependability in any services requiring instantaneous stopping and starting.



For over half a century, C-W Motors have been dependable "work-horses" of industry — powering many of the first machines converted to electric drives.

Today's C-W Protected-Type Motors are designed to maintain this "head start" in motor engineering. That's why they are first choice of so many manufacturers for drives that must operate at top efficiency day in and day out, without downtime for frequent maintenance and repairs.

Smooth, rugged streamlined frames fully protect windings against dripping liquids and falling chips. Prelubricated, double-row width sealed bearings need no attention for at least five years. All designs conform to latest NEMA standards.

For machine tools, pumps, compressors, stokers, presses, blowers, crushers — for any installation calling for a protected-type motor — specify Crocker-Wheeler, and compare performance. See for yourself how time-proved "know-how" pays off, in dependable, trouble-free drives.

Bulletin SL-300-1A gives complete details of the complete line of C-W Protected-type Motors, in NEMA frames 203-505 inclusive, and in ratings above NEMA frames. Write for your copy. Address: Elliott Co., Adv. Dept., Jeannette, Pennsylvania.

CW-12

ELLIOTT COMPANY

CROCKER-WHEELER DIVISION

Ampere, N. J.

Branch Offices: Atlanta, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Houston, Kansas City, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Newark, Philadelphia, Pittsburgh, St. Louis, Salt Lake City, San Francisco, Seattle, Tulsa, Washington, Wilmington. Representatives in principal cities.

Elliott motors and generators larger than the Crocker-Wheeler line are built by the Ridgway Division at Ridgway, Pa.

GET THIS BULLETIN FOR COMPLETE DETAILS AND SPECIFICATIONS

Keep heat and heating costs from

"HITTING the CEILING"

THIS WINTER, why not see that you get *all* the heat you are paying for? Let Thermolier Unit Heaters bring both your heat—and your heating costs—down to a *reasonable* level.

HEATING COMFORT Thermolier Unit Heaters provide quick heating from a cold start. Desired temperatures are easily maintained within a close range. Heat is uniformly distributed in the working zone by forced air circulation. It is a very flexible system because different or changing heating requirements are easily satisfied by means of different models, a range of capacities, single — or two-speed motors and individual thermostatic controls.

LOW FIRST COST Thermolier Unit Heaters are so efficient and so compact that their heating capacity is often equivalent to the capacity of cast iron radiation or pipe coils of twice the cost. Additional savings are effected because the system requires a proportionately smaller amount of pipe, fittings and accessories.

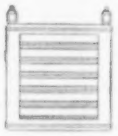
ECONOMY OF OPERATION Heat is forced down to the working level . . . not banked uselessly at the ceiling level. Heat is turned on and off merely by throwing a switch either manually or automatically by simple thermostatic controls. The rapid response means that heat is furnished only when and where it is wanted . . . no heat is wasted.

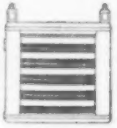
ADAPTABILITY TO EQUIPMENT AND FLOOR LAYOUT Thermolier Unit Heaters are widely used in industrial plants and warehouses, garages, stores and public buildings. The units and the simple piping are overhead where they do not interfere with arrangement of operating machinery or equipment and do not take up valuable floor or wall space. Units are easily relocated at any time to meet changes in layout.

THERMOLIER UNIT HEATERS HAVE IMPORTANT CONSTRUCTION ADVANTAGES The design of Thermolier Unit Heaters is the product of Grinnell Company's 100 years of heating experience. Heating experts like Thermolier's dependable operation, freedom from maintenance troubles and durability. Typical of its construction features is the patented internal cooling leg which permits the use of a plain thermostatic trap, the simplest, least expensive kind of a trap. Other features are built-in drainage, continuous rated capacity and provisions for expansion of U-tubes.

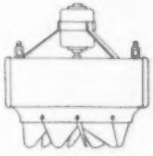
Get in touch with Grinnell or your local Thermolier distributor.

There is a type and capacity of Grinnell Thermolier for maximum heating results under every condition.


textile model


horizontal delivery

velocity nozzle


vertical delivery

GRINNELL

THERMOLIER UNIT HEATERS

Grinnell Company, Inc., Providence, R. I. Branches: Atlanta • Billings • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

BULLETINS just released and of immediate plant interest

ELECTRICAL, LIGHTING

101 Custom Built Equipment—The advantages of using electrical equipment built to job requirements, and the work involved in its production, are touched upon in Bulletin 2-200. Illustrates and describes a-c and d-c motors and generators, motor-generators, frequency changers, battery chargers and electrolytic power supplies. The Electric Products Co.

102 Contact Switches—Included in this bulletin are line drawings and charts giving information on sizes, designs and materials available in company's standard contact blades, lug adapters and insulating separators. Also provided are details on an engineer's kit, a unit containing working samples of bushing stock, mounting brackets, contact assemblies and fixtures, fish paper, contact blades and lifters. Guardian Electric Mfg. Co.

103 Protected Motors—Revised Bulletin B-4687 is on company's chemical motors designed and built specifically for use in presence of corrosive fumes and liquids. Tells construction details which contribute to increased protection and longer service life under severe operating conditions. Includes salt-spray test data on these motors and describes in detail the protective coatings used. Motor Div., Westinghouse Electric Corp.

104 Circuit Breakers—Bulletin 2410 describes fully magnetic, non-thermal, non-enclosed, general purpose circuit breakers. Illustrations, charts, diagrams, graphs and cutaway drawings show company's line of one-, two- and three-pole breakers for general industrial use. Special treatment is given subjects of true inverse delay, high press latch and magnetic blowout. Time overload curves and coil resistance curves are also included. Besides terminal construction, several types of coil connections are described. Heinemann Electric Co.

105 Official RLM Specifications—This is the recently-revised, 44-pp booklet covering 18 RLM specifications for industrial lighting equipment. Specifications cover various types of reflectors, fluorescent lamp units and diffusers. Booklet also explains procedure for developing standard specifications, and testing and inspection requirements. RLM Standards Institute, Inc.

106 Selection Data on Lighting Fixture Hangers—Catalog 50, 80 pp contains general and detailed information, including specifications, on company's standard line of disconnecting and lowering lighting fixture hangers, accessories, special devices and parts. Sectionalized for easy reference, utilizes over 247 photos and drawings to show construction principles, operating features, typical installations, modifications and component parts for both indoor and outdoor units. Unit packages for diversified outdoor lighting are described. Shock absorbers, pulleys, rigid and adjustable suspension fittings are presented, as are details on new suspension yokes and data on concealed mounting units. The Thompson Electric Co.

TOOLS, WELDING

107 Engineers' Tool Case—This single-sheet bulletin describes a new vulcanized fiber tool case for technicians and engineers. Lid and hinged partition have sewn tool pockets, two with zipper covers for small loose tools. Bottom of case is partitioned for instruments and larger tools. Complete visibility is provided. Case weighs 6¼ lb, is 18 by 12 by 5½ in. and costs $24. Technical Tool Case Co.

108 Portable Maintenance Welder—Four-pp bulletin, in color, covers a new portable gun welder rated at 16 kva designed for quick easy spot welding maintenance and production work. Plugs in any standard socket. Built in casters and handles provide hand truck mobility. Built-in storage space is provided for extra horns and tongs. Special arms and tips are available for unusual applications, or water cooling. Rex Welder and Engineering Co.

109 Tooling Manual—Catalog 18, 36 pp, company's newest edition, contains many suggestions on the use of tools described, as well as pertinent technical information. Provides full ordering information on line of mills, deburring tools, tubing cutters, reamers, countersinks and other tools. Completely illustrated, includes prices. Severance Tool Industries, Inc.

110 Arbor Stand — Bulletin MS-5 describes an arbor stand which makes a light duty air press out of a standard air motor. Photos show how motor can be quickly nose mounted in the upright arbor which is easily attached to an interchangeable heavy steel plate base. Includes dimensions, specifications for eight of company's air motors. The Bellows Co.

111 For Drilling Concrete—Rotary bits designed to do a fast, quiet and clean job of concrete drilling and hold down the cost per tumble hole are described in this folder. Provides specifications, tips on drilling and a complete price list covering all drill sizes from ¼ to 3 in. Rotary Concrete Drill Co.

INSTRUMENTS AND CONTROLS

112 For Daylight Ultraviolet Analysis—Form 48 describes and illustrates company's portable fluorescence detector-comparator—a self-contained instrument for making ultraviolet fluorescence examination of small specimens of ores, sands, etc., or larger flat areas of equipment. Discusses versatility of instrument, other advantages. Menlo Research Laboratory.

113 Smoke Alarm—Bulletin 110 describes a low cost smoke alarm for use on coal, oil or gas burning installations. Illustrates lamp and alarm units, methods of installation. Gives specifications, installation tips, ordering information. General Power Plant Corp.

114 Photoelectric Equipment—Illustrated catalog 550 describes in detail company's latest photoelectric amplifiers—33 in all—for industrial applications, production control, counting, boiler and ventilating smoke detectors, burglar and warning devices, also accessory equipment. Tells applications, gives specifications. De-Tec-Tronic Laboratories, Inc.

115 Crankcase Oil Tester—A photoelectric instrument for testing crankcase oil—described as the first of its kind—is introduced in Bulletin 750. Explains and illustrates how the tester works to measure contamination of oil in diesel, other internal combustion engines. Photovolt Corp.

116 Operation and Process Controls—Bulletin CMR-5 illustrates and describes company's contact meter-relay built with electro-magnetic locking contacts for direct control on ⅛ uA or 0.1 mv. Explains basic control circuit, locking contacts, polarity of windings. Gives prices, ranges. Assembly Products, Inc.

117 Water Feeder — Contending that thirsty boilers are bad actors, this folder discusses hazards of low water and the protection afforded by company's boiler water feeder and feeder cut-off combination. McDonnell & Miller, Inc.

MECHANICAL POWER TRANSMISSION

118 Worm Gear Speed Reducers—Illustrated Bulletin G-WBV, 32 pp, on single reduction horizontal or vertical worm gear speed reducers includes latest AGMA horsepower ratings, and discusses the advantages of worm gearing. Describes and illustrates available types and tells how to select speed reducers. Gives specifications, dimensions, arrangements. Also covers overhung and thrust loads, speed reducers for cooling tower service, couplings, and herringbone gear reducers. Imo-DeLaval Products Div., DeLaval Steam Turbine Co.

119 Speed Reducer Data — Engineering Bulletin 1106 offers 16 pp of information on concentric shaft speed reducers, covering their selection, ordering and use. Fully illustrated, includes dimensions and such data as minimum sprocket diameters, maximum overhung loads, weights and oil capacities. Also provides torque capacity and horsepower rating tables, AGMA service factors. The Falk Corp.

120 Speed Reducer Catalog—Herringbone speed reducers of the single, double, and triple type, are presented in the 1950 edition of Catalog 70, 128 pp. In addition to general descriptions and product information, this fully illustrated catalog includes dimensions, rating table, service factors and engineering data covering selection and use of variable speed devices. Many installations pictured. W. A. Jones Foundry & Machine Co.

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September, 1950

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PLANT ENGINEERING

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Also, use this card for more information on advertised products.

121 Practical Gear Manual—Newly revised Catalog 35 is pocket-size but contains more than 300 pp of information on stock gears and other mechanical power transmission equipment, including new items and application, selection and ready reference data not given in earlier editions. Also includes product and engineering information, provides formulas, horsepower rating charts, reference labels and selection charts to enable quick figuring of correct power drive. Among products listed for the first time are company's Boat-Bronz oil impregnated, porous bronze bearings. Boston Gear Works.

122 Longer Life for Bearings—Bulletin 57B describes an economical three-step metallizing process which provides hard, oil-holding surfaces for new and worn bearings and involves the use of Sprabond Wire, a self-binding metallizing material. Describes and illustrates use of the material on spindle bearings, other applications. Metallizing Engineering Co., Inc.

123 Engineering Data on Multiple V-Drives—Complete information on the selection of multiple V-drives, including company's Pul-Grip sheaves and Mor-Grip multiple V-belts is provided in 16-pp Bulletin MVD-1000. Reference tables give ordering information. Maurey Mfg. Corp.

124 Catalog on Bearings—Form 15 presents company's powdered metal and wood bearings, bushings and machine parts described as oilless and self lubricating. Covers Graphex, Coprex and Woodex brands, tells where and how to use them, giving dimensional tolerances, recommendations for machining. Included with catalog is a bulletin giving standard sizes of bearings. Wakefield Bearing Corp.

125 Packaging for Roller Chains—Company's packaging program for roller chains and parts is described in Bulletin 57-50. Covers chains and coupler, connecting, roller and offset links. Available standard packaged quantities are listed together with package weights and list prices. Morse Chain Co.

126 Speed Transmission and Control—A handbook and ordering guide, 48-pp Catalog 45 illustrates and describes company's variable speed transmission and speed controlling devices. Explains and illustrates construction and design features, principle of operation. Tells where to use transmission to advantage and how to install it. Includes photos of many installations, also dimension tables, motor sizes and speed ranges. Lewellen Mfg. Co.

127 Gear Coupling—This bulletin illustrates and explains the simplified seven-part construction of company's gear coupling and compares it with other gear types. A check list of advantages is included, as are photos and descriptions of typical installations. Also provided are detailed plan drawings and specifications for standard, mill motor, vertical shaft, spacer and floating shaft types. Service factors and selection tips are given. Sier-Bath Gear & Pump Co., Inc.

128 More Pull for Belts—This bulletin describes a belt preserving fluid which greatly increases a belt's pulling power and which, through consistent use, is expected to clean off lumped-up belt surfaces. Includes test data on belts before and after treating. Chesterton Mechanical Packings.

PUMPS

129 Deep Well Turbine Pumps—Bulletin 4708, is a 20-pp booklet in color, with photos and cutaway illustrations showing construction details, various types of drive and typical installations of company's deep well turbine pumps. Although widely used for pumping water supply from deep wells these pumps have many other applications. Booklet discusses construction of column and shaft, and bowl assembly, stressing special features. Discusses use of these pumps in water works, industrial service, condensate and boiler feed service, and as industrial solvent pumps. The Deming Co.

130 Sump Pumps—Catalog E-748 illustrates design and gives construction details of company's general service sump pumps available with round or rectangular covers, in single or duplex units. Pumps are designed for quick automatic drainage. Sizes, selection tables, recommended sump diameters included. Economy Pumps, Inc.

131 Multi-Stage Centrifugal Pumps—Revised Bulletin 241, 6 pp, discusses company's four- and six-stage pumps designed for long service and low maintenance. Describes construction features and design details and includes cutaway illustrations of a six-stage pump. Metal specifications, full dimensional data included. Warren Steam Pump Co., Inc.

CONSTRUCTION

132 Handbook on Insulating Material—Form C91051, 36 pp, tells the story on normal temperature applications of FC Foamglas insulation for industrial plants and public buildings. Includes new information on its installation in floors-on-ground; the use of the materials as a wall lining for erecting free-standing interior walls, and for ceiling insulation. Also contains technical data, facts about accessory materials available and a description of trowel finishes for direct application. Pittsburgh Corning Corp.

133 Curtain Wall Construction Data—Form SS19, 24-pp, is a progress report on the methods prescribed for use of stainless steel curtain walls. Describes briefly and illustrates non-structural and structural stainless steel facing, reinforcing stainless steel facings and combined system with structural insulation. Gives construction details covering vapor vents, joints, attachments and windows. Also discusses shapes and textures available and possibilities for large size curtain walls. Allegheny Ludlum Steel Corp.

134 Chemical Construction Materials—General Bulletin MCC 1 covers corrosion-proof linings and cements as well as acid-proof brick and tile, corrosion-proof brick sheathings, protective coatings and corrosion-proof floorings. Includes descriptive, application and estimating data, also information as to strength, chemical resistance. Atlas Mineral Products Co.

135 Waterproofing Membrane—Here's a booklet on the use of Glasfab, an inorganic membrane fabric which holds and suspends waterproofing agents in a strength-giving mesh to resist water seepage. Pictures its use in various waterproofing jobs, in roofing, process pipe covering. Explains Glasfab's resistance to rotting, charring and wicking, and other features. Gives specifications, data on strength-to-weight factors. Byerlyte Corp.

MATERIALS HANDLING

136 Fit the Caster to the Job—To help plant engineers pick the right caster for any type of service, manufacturer offers Catalog K-38, 50 pp, providing ordering information, plus a 12-pp selector bulletin giving ready answers on all selection problems. This bulletin is divided into sections covering semi-steel, solid rubber, vulcanized-on-oil-resisting and Celeron wheels, and each section is divided by load capacity, bearing types, wheel diameters, heights, with special columns covering companion rigid casters. Includes catalog reference page numbers. A table gives throw of any size and type of caster so you can determine the swivel radius required. Bond Foundry & Machine Co.

137 Truck Attachment Specifications—Standard attachments for increasing the usefulness of company's fork lift trucks are the subject of Bulletin SS-1501. Describes and gives dimensional specifications for fork extensions, rams, shovels, overhead guards, cranes and safety racks. Photos show each attachment in use. Industrial Truck Div., Clark Equipment Co.

138 Conveyors on the Job — A dozen examples of what modern conveying systems can do—from coal handling installations that make good neighbors of power plants to flour handling installations at bakeries—are described and pictured in Vol. 194 of company's house organ, the 6A Conveyor. Also described are centrifugal loaders and pliers and other equipment. Stephens-Adamson Mfg. Co.

139 Roll-Top Doors—This bulletin covers company's all-steel roll-top doors with galvanized steel sections, stressing their wide range of applications. Gives specifications and illustrates construction and installation details. Discusses electric motor operator, chain operator, special door types. The Kinnear Mfg. Co.

140 Cranes for High Lifting Jobs—Illustrated Bulletin HL-115 describes design and construction of a new line of high lift, auxiliary overhead electric traveling cranes. Brief specifications are supplemented with photos of sub-assemblies, close-up views and installations in various services. Northern Engineering Works.

141 Diesel Tractors and Engines—Industrial tractors, bulldozers and related equipment as well as diesel engines and

(Continued on page 101)

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Where painting is difficult and costly, aluminum roofing and siding save money—immediately on first costs and continuously on maintenance. Think about this, then figure your next job with Alcoa Aluminum Building Sheet.

Alcoa Building Sheet is immediately available with all correct fasteners and accessories for easy assembly. For application and engineering details, call your nearby Alcoa sales office, listed under "Aluminum" in your Classified Telephone Directory. Or mail the coupon.

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Lengths: 5 to 12 feet. Widths: Roofing, 35 inches. Siding, 33⅓ inches.

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PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Safe Coal Piling

FIRES CONTINUE to occur from spontaneous heating in the storage of soft coal which is improperly arranged. In order to avoid the inconvenience, lost motion and economic waste which extinguishing operations bring about in an emergency, the following suggestions are offered as a guide in minimizing the spontaneous heating tendencies of soft coal storage.

Coal Piling—1. Before piling coal, thoroughly clean area of all combustible material. 2. Avoid storing near external sources of heat. 3. Clearances of from 25 ft to 100 ft should be maintained between coal piles and combustible buildings, depending on the size of the piles and importance of the buildings. 4. Movement of air through the pile should be prevented as completely as possible. 5. Coal should preferably be piled in flat rolled layers not over 3 ft deep, each layer leveled off and rolled compactly to prevent air circulation, thus practically eliminating spontaneous heating. 6. Where extensive piling is necessary, ¾ in. pipes (for lowering thermometer) *sealed at the bottom and capped when not in use*, should be maintained in pile on not more than 25 ft centers and temperature readings taken weekly.

Watch Temperature—7. When temperature at any point exceeds 140 F, pile must be watched closely and daily readings taken. If temperature reaches 160 F, dig into pile, remove the heating coal and spread it out in shallow piles to cool. In no case should coal remain in the stock pile if temperatures exceed 175 F. 8. If actual ignition of coal has taken place, extinguishment can only be accomplished by removing burning coal from pile, spreading it out at a safe distance from stock pile and quenching with plenty of water. 9. Samples of coal should be frequently analyzed for sulphur content while pile is being built up. Spontaneous heating is most probable in coal containing 0.6 per cent or more sulphur, and the storage of coal with more than 1.0 per cent sulphur content is undesirable.

General—10. When coal is received wet, it should be stored so that it can dry out readily. 11. Watchman service should be extended to include a tour of the coal storage area on each round. 12. Coal storage yards should be protected by a manproof fence and adequate yard lighting is recommended. 13. The handling of soft coal inside of buildings creates considerable coal dust, which may produce an explosive mixture.

Special attention is also called to the importance of explosion relief, explosion-proof switches, dust-tight lights and motors and the use of vacuum cleaning equipment. The use of magnetic separators interlocked with conveyor equipment is urged for the removal of spark-producing tramp iron. *From the Sentinel, a publication of Factory Insurance Association, Hartford 2, Conn.*

"Cat Asphalt" Answer To Canal Seepage

SEEPAGE CAN cause the loss of up to 60 per cent of irrigation water in canals, turning the area around the canal into a swampland and bringing alkaline salts to the surface, ruining arable land.

The Bureau of Reclamation and a number of private and other government agencies have spent many years in research in an effort to answer the canal lining need.

The answer is a "catalytic pentoxide air-blown asphalt," and is produced through conventional air blowing methods of asphalt manufacture with the exception that a new catalyst, phosphorous pentoxide, is united with the asphaltic residua at a prescribed stage of processing. The result is an asphalt which resists flow tendencies at high atmospheric temperatures, maintains unusual flexibility at low temperatures, has an extreme toughness of film and maintains a remarkable resistance to heat and to weathering.

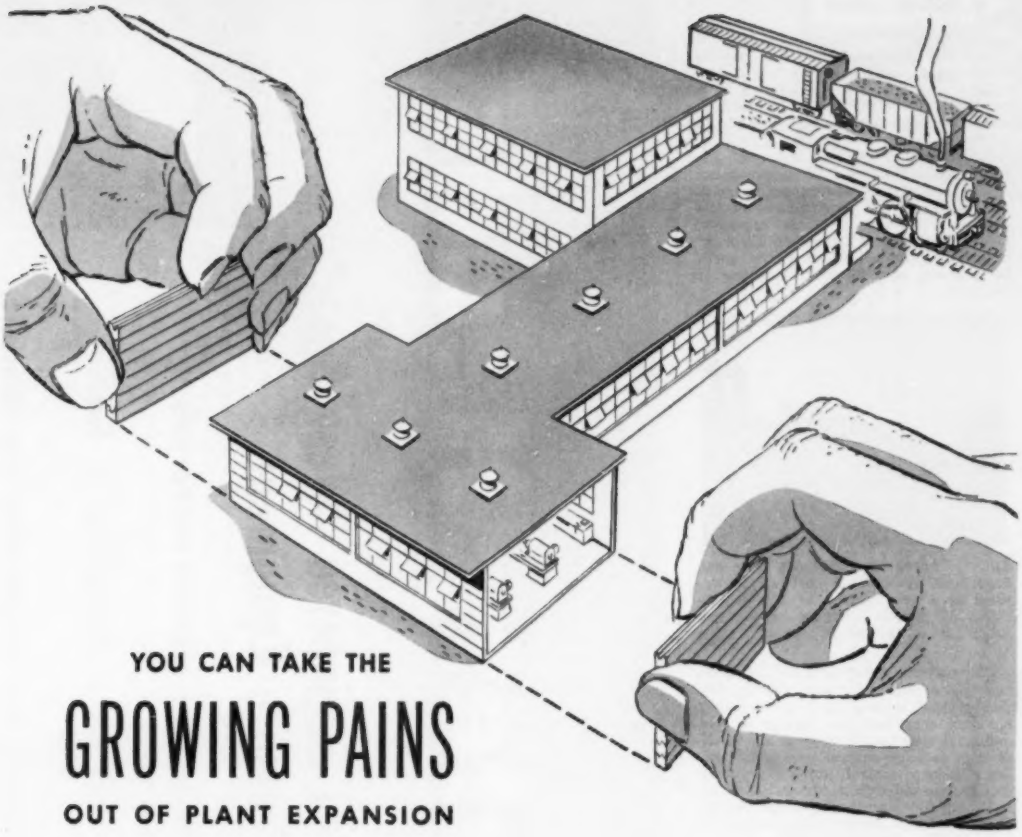
Fig. 1. The membrane is tough enough to be picked up like a rug, yet it is plastic enough to deform with soil movement without rupturing its form

A simple basic procedure was developed for the application of the new lining. The canal is first over-excavated to a depth equal to the depth of earth cover required over the membrane—usually one foot. The excavated soil is reserved for later use in covering the membrane. A smooth subgrade is prepared, with little necessity for packing because the membrane is flexible enough to withstand subgrade movements without being injured or ruptured.

The asphalt is heated and then sprayed on the subgrade, forming a membrane from 1/16 to 3/8 in. in thick-

Keeping Plant Clean is an Everyday Chore

Left: This is a good example of clearly defined and well-kept aisles. The material is piled neatly and confined within the line markings. Center: This worker is going out of his way to keep plant clean. He is on walkway of overhead crane, cleaning beams and trusses with vacuum cleaner Right: In any cleaning operation the final result is a collection of dust and scraps. Here scrap buckets are piled uniformly. Note the cleanliness of floors and observance of aisle markings. (From The Westerner, a publication of The Western Cartridge Company, East Alton, Illinois)



YOU CAN TAKE THE

GROWING PAINS

OUT OF PLANT EXPANSION

It's costly in labor and materials to knock down outside walls and build new ones farther out. Why not just move them?

That's almost what you do with curtain walls of Fenestra* "C" Panels. You can quickly, easily and economically dismantle, move and re-install them . . . when the time comes to expand your plant.

You even have more room to start with. Take a plant 150′ by 250′, for example. Instead of the usual 12″-thick brick wall, use 3″-thick "C" Panels. You'll have 602 extra sq. ft. of floor space. And your "C" Panels' filler of Fiberglas gives you equal insulation.

You have walls lightweight and noncombustible. As strong as fine steel can be. So smooth that dirt and grease can't get a grip.

Call your Fenestra Representative today (he's listed in the yellow pages of your phone book) or mail the coupon.

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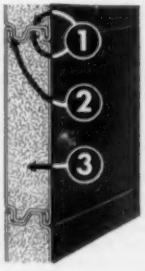
WHAT FENESTRA "C" PANELS ARE

"C" Panels are standardized 3″ deep, 16″ wide, 18 gage painted steel or 16 B&S gage aluminum. Steel panels are 6′ to 14′ long, weigh only 6.50 lbs. per sq. ft. Aluminum only 3 lbs.

Made from two formed members (1) joined into a structural, vapor-sealed unit. Asphaltic impregnated felt (2) is inserted inside full length between members and end closures to prevent metal-to-metal contact. Filled with insulation (3). Double tongue and groove joints give three positive bearing surfaces per panel, making wall of "C" Panels an integral load-bearing unit to resist wind loads. Erection, horizontal or vertical, is quick, easy. Smooth surface for easy flashing details.



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ness. The membrane hardens into its plastic, rug-like form.

After the membrane is applied, it is covered with earth, usually by the fast, low-cost dragline casting method, to prevent later mechanical damage. Even the cover material may not require compacting as it usually seasons into a stable form during operation of the canal. Proper engineering of the canal slope is required, however. Gravel blankets of from 4 to 12 in. in depth may be placed over the earth to prevent erosion and sloughing if required.

Fig. 2. Recent development uses bar supported by springs. Asphalt is applied at a temperature of 415 deg at about 50 pounds pressure. A load of 1,200 gal is applied in about 20 min

The potential projected for the new asphalt developed by Lion Oil Co. indicates that its use as a canal lining has just scratched the surface of demand. It may be put to good use in all sorts of seepage-control jobs—dike and levee leakage control, lining lily ponds, golf course water hazards and even as a lining for water supply reservoirs. *From Lion Oil News, a publication of Lion Oil Co., El Dorado, Ark.*

Flammable Liquids— Handle With Care

So common is the use of flammable liquids, both inside and outside of industry, most of us have by habit acquired a lack of respect for the potential hazards of these materials.

Records reveal that many disasters could have been avoided but that the "human element" — carelessness in the handling of flammable liquids—was the principal, if not the sole, contributing factor.

Most commonly overlooked is the fact that flammable liquids vaporize continuously, just as water does and that the higher the temperature, the faster the rate of evaporation. Whereas water has a constant boiling point (measured at sea level) of 212 F, flammable liquids have a wide range of boiling points, a few actually boiling at or slightly above room temperature.

These so-called "low boilers" generate hazardous vapor-air mixtures rapidly when exposed to air, and produce proportionately greater volumes of explosive mixtures as the temperature of the liquids increases. The flash fire and explosion hazards of these materials are thus inherent, being present wherever and whenever the liquids are stored or used.

Though most flammable liquids and their vapors have a characteristic odor, unfortunately their presence may es-

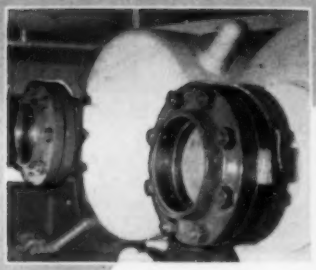
B&B Safety Heads

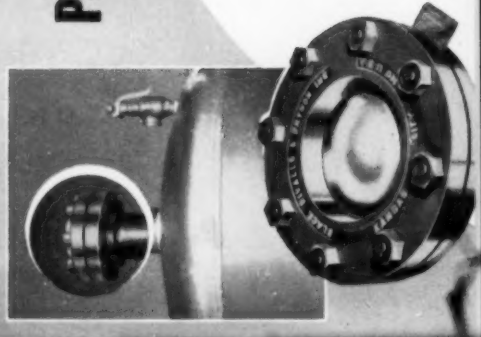
Purposely Designed and Engineered "Weak Spots" For Your Pressure Equipment

They safely handle highly viscous materials in undue pressure rises;

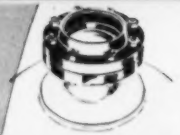
Provide relief venting for a dangerously fast pressure rise;

Afford extra protection for expensive equipment.





BS&B SAFETY HEADS...What They Are...How You Can Use Them:



This installation is used when it is not necessary to have a shut-off or when materials handled are not toxic or inflammable.

A SAFETY HEAD under your relief valve or BS&B combined safety head-relief valve assembly isolates the valve from the vessel contents. This stops leakage through relief valve until SAFETY HEAD disc is burst by overpressure, as well as protecting valve parts from corrosive, viscous or gummy materials. An open bleed line or some type of telltale indicator must be installed in chamber between rupture disc and valve plug.

BLACK, SIVALLS & BRYSON, INC.
Special Products Division
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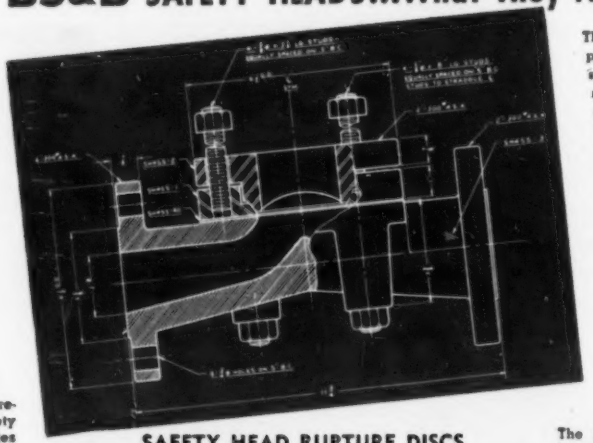
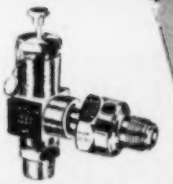


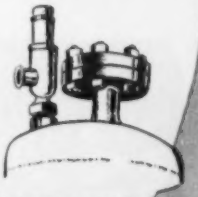
The BS&B SAFETY HEAD consists of three principal parts . . . a pre-formed metal rupture disc and two specially designed holding flanges. Correct element resistant metals are used in fabrication of the rupture disc, which bursts when a pre-determined pressure is reached. Instantly a fully unrestricted escape for gases and liquids takes place. No other relief device acts so quickly as the BS&B SAFETY HEAD.

HOW THE NEW T-ASSEMBLY SAFETY HEAD WORKS

Viscous material washes against the rupture disc as it flows through the curved channel indicated by the shaded portions of the diagram. The material moves on through the passage if no undue pressure rise occurs. However, if the passage becomes blocked, such material will tend to solidify quickly, causing a dangerous pressure rise. In that case, the SAFETY HEAD rupture disc bursts and the pressure is given a fully unrestricted opening.



A SAFETY HEAD at the relief outlet will stop leakage until rupture disc bursting pressure is attained. Not recommended where viscous or corrosive materials might contaminate internal parts of the valve. Investigate your valve design before using this type of installation.



If relief valve, used for primary relief, fails to function due to corrosive, gummy or viscous materials contaminating valve parts, the rupture disc will afford positive protection when pressure rises to disc bursting pressure since a full, unrestricted, pipe size opening is afforded. The Safety Head used as the secondary relief device, would have rupture disc bursting pressure considerably higher than spring setting of valve.

SAFETY HEAD RUPTURE DISCS

The selection of the proper metal for the rupture disc is based upon the conditions of a given application, such as size, pressure, temperature and vessel contents.

BS&B rupture discs are offered in metals listed below.

The following table gives the approximate minimum bursting pressure for a rupture disc of a given material in the various sizes of SAFETY HEADS.

These figures are the practical minimum bursting pressures. In some cases we can furnish rupture discs for pressures below those shown.

MINIMUM BURSTING PRESSURE OF SAFETY HEAD RUPTURE DISC

Diaphragm Material	½"	¾"	1"	1½"	2"	3"	4"	6"	8"	10"	12"	16"	20"	24"
Aluminum	150	130	100	80	50	40	35	25	20	19	18	17	16	15
Aluminum Lead Lined	200	175	135	120	65	50	40	30	20	19	18	17	21	20
Carbon Steel	1750	1200	750	500	300	200	155	115	105	85	65	40	50	62
Copper or Copper Lead Dipped (both sides)	330	225	175	120	65	50	40	25	35	42	55	55	70	60
Inconel	775	525	410	260	150	105	82	61	48	Special				
Monel	570	390	280	190	115	75	65	50	39	33	360	270	215	178
Nickel	600	400	280	195	115	110	100	75	60	47	Special			
Platinum	250	200	140	120	65	45	35	26	Special					
Silver	250	175	125	95	55	40	35	32	27	Special				
Stainless Steel (347)	820	560	435	280	160	115	90	70	55	45	160	120	95	140

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Technical data compiled especially for the chemical, petroleum, refrigeration and air conditioning industries. Proven protection for expensive equipment. Check, sign and mail coupon to BS&B today.

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BS&B SAFETY HEADS

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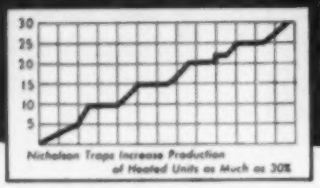
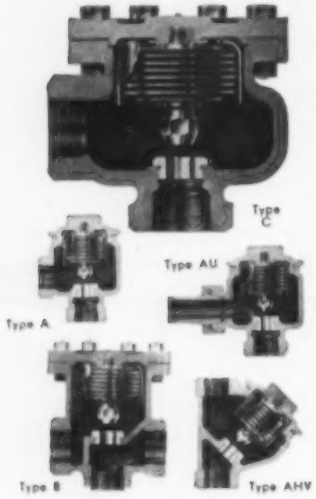
NICHOLSON TRAPS
Raise
PRODUCTION



Leading Processor
SHORTENS OPERATION
from 65 to 45 Min.



Records of a recent installation of Nicholson steam traps, by a leading food packer, show they cut cooking time 30%. For example, one operation was shortened from 65 to 45 minutes. Nicholson units keep equipment full of live steam because: 1) operate on lowest temperature differential; 2) have 2 to 6 times average drainage capacity. Also record low for steam waste; and maximum air-venting capacity. Widely specified for preventing damage to thin gauges of heat transfer units; eliminate cold blow in unit heaters.

5 Types for Every Plant Application:

process, heat, power. Size ¼" to 2"; pressures to 225 lbs. Nicholson trap catalog is a standard reference on drainage methods. Send for **CATALOG No. 250.**

W. H. NICHOLSON & CO.
208 Oregon St., Wilkes-Barre, Pa.

NICHOLSON Traps
THERMOSTATIC ▼ PISTON AND WEIGHT-OPERATED STEAM
GASOLINE AND COMPRESSED AIR TRAPS
CONTROL VALVES ▼ FLOATS ▼ MANDRELS ▼ STEAM AND AIR SEPARATORS

cape attention because the vapors are heavier than air, some even four times heavier, and at normal temperatures will settle to the floor, proceeding to build up from that point, unnoticed.

Another fact frequently overlooked is that these hazardous vapor-air mixtures are easily ignited by sources of heat energy that commonly escape attention. For example, gasoline-air mixtures may be ignited by hot surfaces as low as 500 F. In fact, methyl ethyl ether-air mixtures can be ignited by a hot surface at 374 F and in the case of carbon disulfide-air mixtures, auto-ignition may occur at 212 F, the temperature at which water boils.

Even more insidious as an ignition source is static electricity. Failure to use grounding clamps between the dispensing container or piping and the receiving vessel when decanting or transferring the flammable liquid from one container or vessel to another has caused many fires and many lives to be lost. Transfer of liquids should be by means of pumps. Use of air pressure for transfer should be eliminated due to the possibility of forming explosive vapor-air mixtures.

Tanks and equipment handling flammable liquids should be equipped with proper breather and emergency relief vents. Safe storage locations and equipment should be selected to reduce the possibility of a severe loss. Underground tanks should be preferred wherever practicable.

Serious potential fire hazards are involved in the careless disposal of flammable liquids and plant wastes from the use of such materials. Dumping such wastes into incinerators, furnaces, boilers, etc., is positively dangerous and should not be undertaken. *From Sentinel, May 1950, a publication of Factory Insurance Association, Hartford, Conn.*

Attack on Salt Water

SALT WATER is the most prevalent corrosive agent that plagues civilization. The petroleum industry is particularly aware of corrosion from salt water, through years of dealing with salt brines in oil and gas wells.

In order to learn how to thwart or lessen the power of sea water corrosion, a large-scale scientific investigation is under way at Kure Beach, N. C. The project is a joint undertaking of the International Nickel Co. and the Dow Chemical Co. at the former bromine-from-sea-water plant of Ethyl-Dow Chemical Co., now in "standby" condition.

Currently, the Kure Beach installation embraces a number of studies.

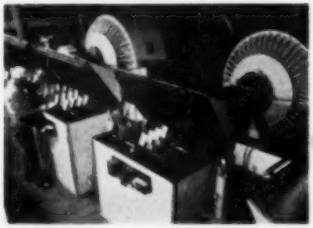
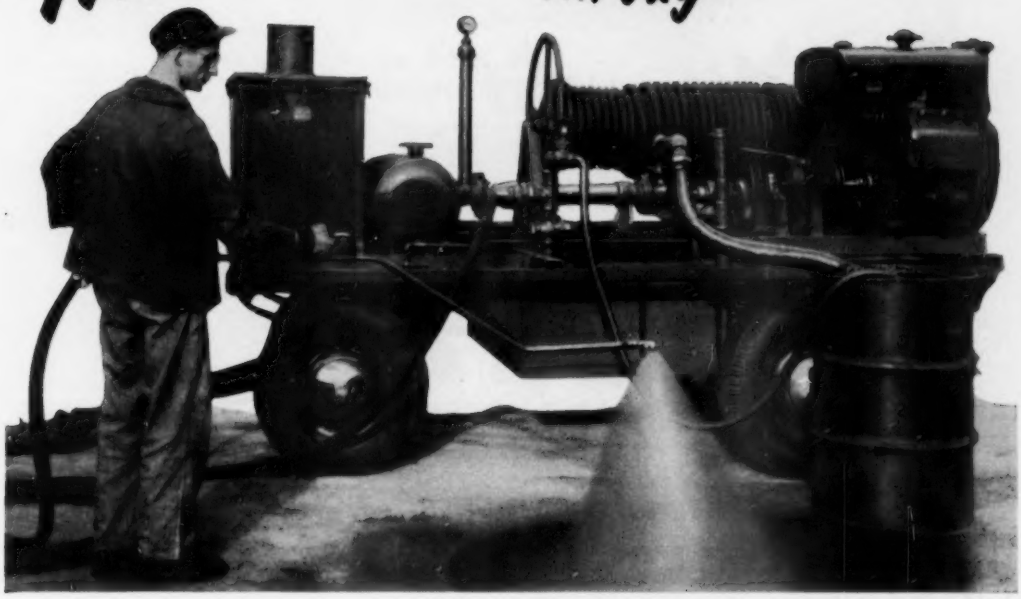


Fig. 1. These 300-ft wooden troughs hold up to 1,000 small samples which are to be exposed to salt water spray

NEW ROOF...through a Hose!



Here's the Pump that Does the "Impossible"

● What *other* pump could do this: move "cold-application" roofing from container drums through 180′ of pipe coil for heating, then to the roof through 400′ of 1″ high-pressure hose—and *still* have sufficient force for spraying? *Moynos* are doing it every day on machines like that above.

It's the Chausse Roofers Spray, made by W. G. Chausse Co., Detroit. Handling 15 g.p.m. at pressures of 200 to 250 p.s.i., it sprays *faster* than men can spot and unroll the felt. And, in the morning, after standing idle many hours, it *clears* the hose without difficulty.

AMAZING PERFORMANCE. Moyno's "progressing-cavity" action is *truly amazing*. It self-primes; creates nearly perfect suction vacuum; delivers positive pressure without pulsation; reverses by reversing rotation. Moynos pump *virtually anything* that will push through a pipe—pass solids in suspension; resist chemicals, abrasives—stand up and *keep going* where other pumps have failed.

If you think all this sounds *too good* to be true, call in your Moyno Man. Or write for Bulletin P-30-E. We'll be *glad* to mail it free.

WHAT CAN IT DO FOR YOU?

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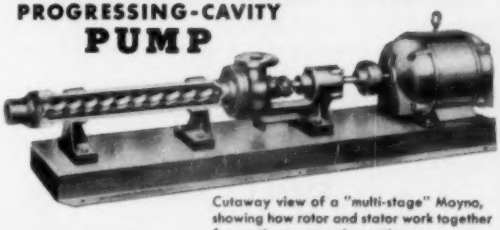
MOYNO®
PROGRESSING-CAVITY
PUMP

NO PISTONS
NO VALVES
NO HIGH-SPEED IMPELLERS



Cutaway view of a "multi-stage" Moyno, showing how rotor and stator work together for continuous pumping action.

ROBBINS & MYERS · INC.
· MOYNO PUMP DIVISION ·
SPRINGFIELD 99, OHIO · BRANTFORD, ONTARIO
MOTORS · FANS · MOYNO PUMPS · FOUNDED 1878

HERCULES COULD GET AWAY WITH IT!

AUGEUS, king of Elis, according to Greek legend, kept 3,000 oxen, and—when Hercules was assigned to the job—their stables hadn't been cleaned in thirty years. The resourceful "strong man" turned the river Alpheus through the stables and cleaned them up in one day.

Hercules could get away with it because he had an unlimited supply of cheap water, and no worries about stream pollution.

Modern industry is less fortunate. Water is not unlimited, and it is becoming increasingly expensive, even when you merely want to throw it away. Today, disposal of waste water requires consideration from many viewpoints. What will you be allowed to discharge into a stream which is a source of water for others? What values can you recover from your waste? More and more, industry is coming to look on its water as an essential and valuable engineering material to be conserved, recovered and reused.

Hall engineers analyze your water problems from that point of view. The procedures which they recommend for the most efficient use of water are technically sound, practical, specific and economical. Waste disposal methods are included in these recommendations—but in many instances more efficient water use may almost eliminate the disposal problem.

If you are concerned in any way with industrial water problems, you will be interested in two new Hall bulletins. "Your Most Important Raw Material" deals with industrial water problems in general and "Let's Consider Your *Whole* Water Problem" discusses the relation of water use to problems of waste disposal. May we send you copies of either or both? Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

HALL *plant-wide* WATER SERVICE

BOILER WATER CONDITIONING

PROCUREMENT, TREATMENT, USAGE AND DISPOSAL OF INDUSTRIAL WATER

Complete and intermittent submergence of samples and commercial items of equipment is provided in the marine basin. Over 10,000 test pieces have been subjected to all conditions of tidal exposure, except that of surf action. Protection from direct wave action is necessary to prevent damage and loss of samples during storms.

On the beach, at varying elevations and distances from the water, test racks expose additional samples to the combined effects of sun, sea spray, and sea air.

One project employs a device termed the "whirlagig." Individual metal samples are attached to a horizontal disk mounted on a drive-shaft. Submerged in fresh sea water, this disk revolves

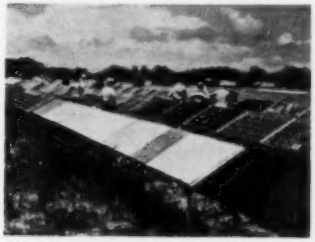


Fig. 2. Atmospheric test lot where as many as 900 samples may be studied

rapidly, reaching peripheral speeds of 30 fps. This sort of frenetic washing machine gives metals a bad time, simulating, in a matter of months, years of service in condenser tubes, pump impellers and propellers.

Another device is termed the aspirator-type jet impingement test apparatus. This exposes submerged specimens to high-speed jets of sea water mixed with air bubbles. High-speed galvanic testers also impose severe service conditions on samples and equipment items.

Lower velocity tests are provided in a wooden trough system. This 300-ft system will hold up to 1,000 small samples, and a continuous fresh sea water current of 3 fps is maintained. Still another project concerns corrosion studies of various salt solutions.

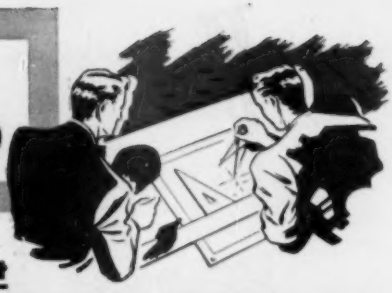
Another sector of the Kure Beach corrosion testing laboratory comprises a one-acre lot, situated 800 ft from the water. This fenced area provides space for 40 racks, each of which will support 700 to 900 specimens at an angle of 30 deg from horizontal, facing southward. In this area, considered near the borderline of the undefinable "marine atmosphere," is exposed the largest collection of metals, alloys, and coated samples ever assembled for atmospheric corrosion testing.

Studies are by no means restricted to examination of specimens of various metals, alloys and coatings. Many tests involving actual equipment and parts are conducted, providing practical findings which are translated readily to substantial savings in corrosion damage. *From Ethyl News, a publication of Ethyl Corp., New York 17, N. Y.*

Degreasing Small Parts

IN GENERAL, "small parts" fall within three classifications: precision work, flat work, and cupped and machined work. Examples of each of these classes

ASK ADSCO



to help you select the right

HEAT EXCHANGERS

Few heating or cooling problems are exactly alike. In some cases, standardized equipment can be adapted for installation, with substantial savings in cost and delivery time. On the other hand, many problems require specially designed units to meet specific operating needs.

In either case, ADSCO can provide the right equipment, expertly designed and fabricated. ADSCO offers a complete line of standard or custom-made heat exchangers in a wide variety of types.

STRAIGHT-TUBE FLOAT HEAD HEAT EXCHANGER with Removable Bundle

This ADSCO unit has extensive applications in many fields. It can be furnished as shown or with non-removable bundle. Tubes may be of copper, stainless steel or special alloys. Shells may be fabricated of carbon, stainless or nickel-clad steel or copper silicon or other alloys.

INSTANTANEOUS WATER HEATER Water Tube Type

ADSCO instantaneous heaters include: convertors, water heaters, condensate coolers, booster heaters, oil heaters, economizers, etc. . . . gravity or forced circulation . . . vertical or horizontal . . . steam or water tube type. Usual construction is steel shell with removable copper U-tubes. Thousands of these ADSCO heaters are in use today.

STORAGE HEATER

This heater, with removable U-tube element, can be furnished in either horizontal or vertical design. Shells are fabricated, per A.S.M.E. Code, of copper silicon alloy, stainless- or nickel-clad steel, galvanized or black carbon steel. ADSCO corrosion resistant treatment adds life to black steel tanks.

ASK ADSCO for expert engineering recommendations, drawings or estimates to meet your specific problems . . . or consult your ADSCO representative. No obligation, of course.

ADSCO

EXPANSION JOINTS — HEAT EXCHANGERS
STEAM TRAPS — STRAINERS — METERS
CASING — ANCHORS — GUIDES

Leaders Since 1877

AMERICAN DISTRICT STEAM CO.
NORTH TONAWANDA, N. Y.

FOR ECONOMY... UTILITY... SPEED

use Ramset System

FASTENING SYSTEM

When fastening into steel . . . concrete . . . masonry

Push costs down and get work finished faster by using RAMSET SYSTEM for most fastening jobs in steel or concrete. Sturdy, dependable RAMSET TOOL instantly sets any one of 65 drive pins or threaded studs. No muss, no fuss, no trouble.

Cost-saving and time-saving advantages of RAMSET are being proved every day by thousands of users . . . with time and costs cut as much as 70% over old-fashioned methods.

Ask for a 15 minute demonstration and proof of RAMSET'S ability to outwork less efficient driving tools. Call your local RAMSET Specialist or ask us for details.

Distributed by

Ramset Fasteners, INC.

12117 Berea Road • Cleveland 11, Ohio

PIONEER IN POWDER-ACTUATED FASTENING

may be grouped as follows: Precision work: watch and clock parts, gears, screws, balance wheels, stem winders, etc. Flat work: discs, tube filaments, condenser plates, electrical contacts, etc. Cupped and machined work: stampings, nuts and bolts, screw machine parts, electric motor and generator casings, cigarette cases, shaker cups, etc.

Precision Work—The method generally used in degreasing this work is basket-racking. However, balance wheels, because of their extremely delicate nature, are individually racked. The wire mesh in the basket should be only as fine as is required to hold the work being degreased.

The two-compartment (warm liquid-vapor) and the three-compartment (boiling liquid-warm liquid-vapor) degreasers are readily adaptable for cleaning this type of light work. Most of the cleaning is accomplished in the boiling solvent and the rinse compartments because the light gauge of the work does not permit effective cleaning by condensation of solvent vapors. Passage through the vapor serves primarily to dry the work.

Flat Work—For the most part, flat work is degreased in baskets, especially if the parts are thin and easily damaged. However, as in precision work, the nature of the individual piece determines the proper method of handling. Flat discs of various sizes, shapes, and thicknesses are often handled by both tumbling and basket-racking.

If a slight amount of scratching is not objectionable, flat work of sufficient rigidity, such as round flat discs and electrical contacts, may be degreased by tumbling in hand-operated or conveyorized tumbling baskets.

The three-compartment degreaser lends itself readily to small flat work because of the rapidity with which this work reaches the solvent temperature. Again, most of the cleaning is done in the liquid phases, not in the vapor. The work should be racked shallowly and then removed through the vapor at such an angle as to avoid excessive solvent "drag-out."

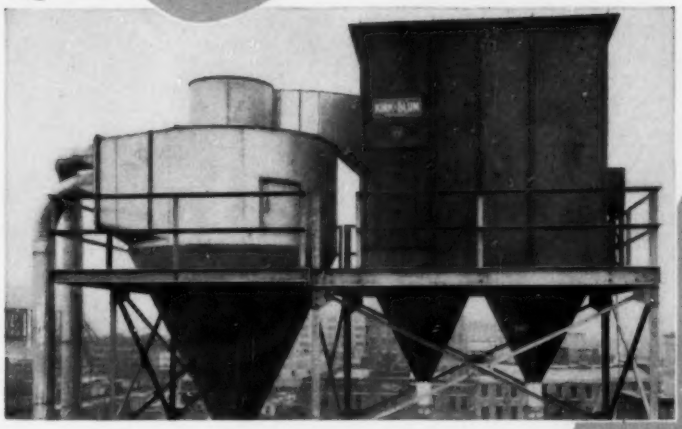
In degreasing such critical basket-racked work as radio filaments, the solvent should be distilled continuously to remove contaminants washed from the work.

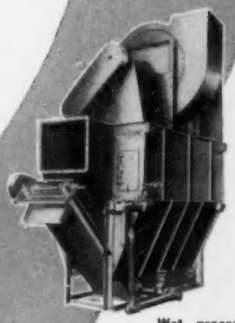
Cupped and Machine Work—Highly machined, threaded, and polished parts are racked individually to prevent damage. Cigarette cases and shaker cups are racked separately to facilitate better cleaning of the inside surfaces. However, stampings, screw machine parts, nuts and bolts can usually be tumbled.

This type of work is especially suited to the automatic type of degreaser where an immersion operation can be efficiently and economically used. The boiling liquid-warm liquid-vapor automatic degreaser is generally used for highly machined, threaded and polished work and for cupped parts. The two-dip automatic unit may also be readily adapted to this type of work by installing a basket tripper to insure good drainage. Attention to such factors as good housekeeping, proper work speed and good racking practice will permit the degreasing unit to be operated efficiently, economically and at a high rate of production. *From an article by R. L. McKeown, in Modern Metal Finishing, a publication of E. I. Du Pont De Nemours & Co., Wilmington, Delaware.*

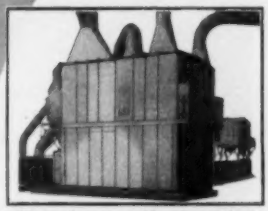
(Continued on page 82)

WHAT KIND OF DUST CONTROL APPARATUS *does your operation require?*





Wet process air cleaning using "Rotoclone."

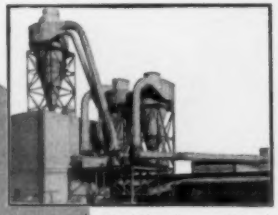


Clean dry returnable air required. Cloth filter selected.

If all dust and fume control problems were alike, there would be no need for specialized engineering service. But these problems vary widely, depending upon manufacturing processes and raw materials used, including many recently developed materials which present entirely new problems. For these reasons, selection of the right units for a really efficient dust or fume control system is definitely a job for engineering specialists.

Kirk & Blum with 43 years of experience in this field, first makes a thorough analysis of your special dust or fume control problem. Next, our Staff selects the right units for your job from among the various makes available—then designs and installs a complete system that is guaranteed by Kirk & Blum to give the results you want.

Play SAFE . . . get the unbiased counsel and planning of experts. For details write to The Kirk & Blum Manufacturing Co., 2889 Spring Grove Ave., Cincinnati, Ohio.



Centrifugal separator suitable for heavy dust concentration.

Combination of centrifugal separator and dry filter.

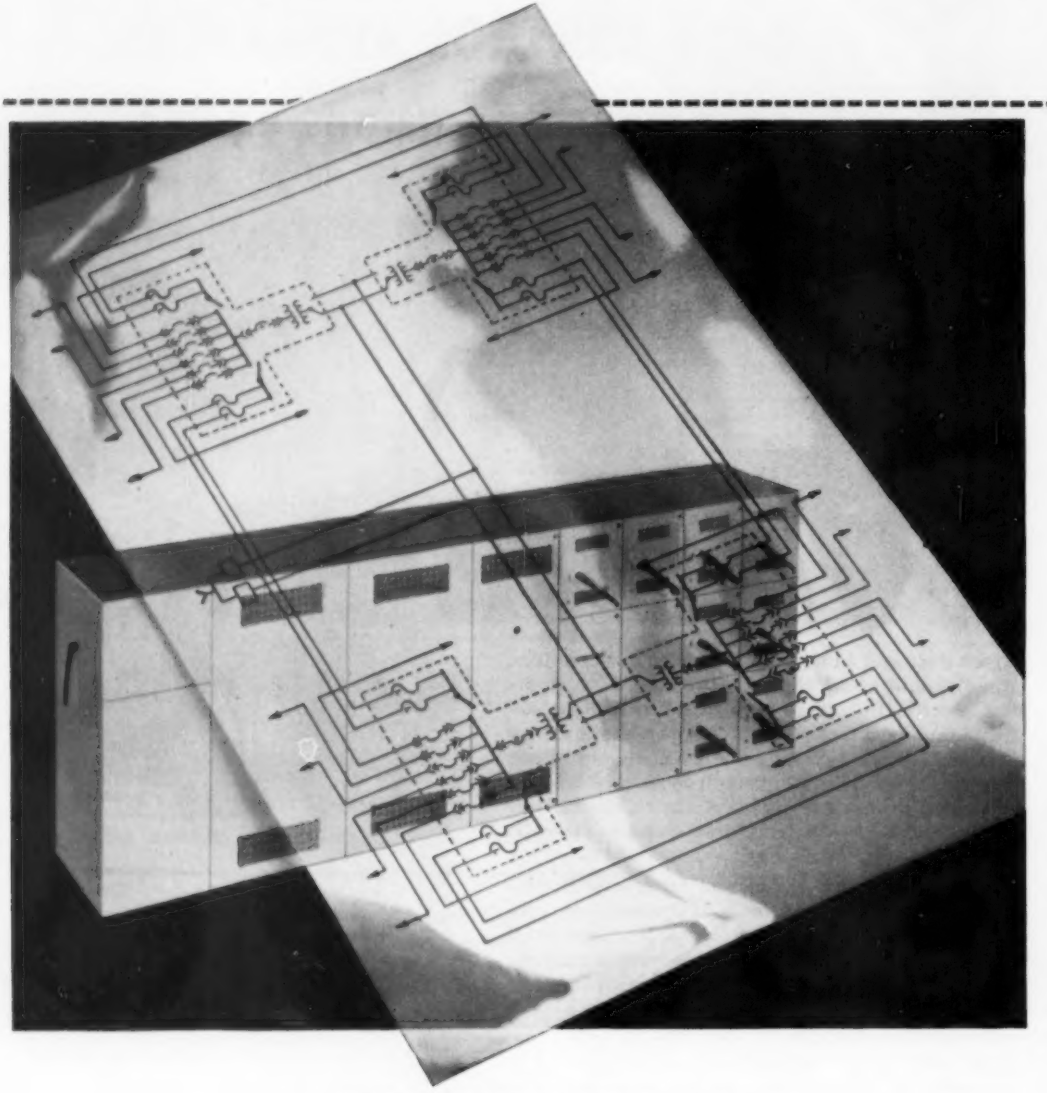
FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM

DUST AND FUME CONTROL SYSTEMS

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



PRIMARY SELECTIVE NETWORK SYSTEM

This modern distribution system provides maximum flexibility to meet changing load conditions. It provides very reliable service with very good regulation and efficiency. By sacrificing these characteristics to some degree it is possible to use other systems whose initial investment is less. To evaluate the system most desirable for your plant, consult your Westinghouse Representative.

Visualize

your power problem this way

Any old way of running wires to your equipment may work . . . but what about efficient, profitable operation?

A modern electrical distribution system can make electrical power do more of *your kind* of work. But again, just any of the modern systems won't do, because there is no all-purpose system to balance all factors. *That's why it's imperative that your system be planned to meet your specific needs.*

Power centers provide the simplest way—the low-cost way—of attaining the system you require.

Westinghouse Indoor Dry-Type Power Centers give you these advantages:

THEY'RE MORE ECONOMICAL—because they eliminate the need for costly vaults and can be located near center of load . . . resulting in shorter secondaries, lower line losses, better regulation.

THEY COST LESS TO MAINTAIN—no liquids to test, recondition or replace . . . no gaskets, valves or gauges. All parts are readily accessible.

THEY'RE SAFER—fire and explosion-proof, they have no exposed live parts. Each breaker is enclosed in an individual compartment. Positive interlocking prevents false breaker operation.

Your Westinghouse Representative will be glad to discuss your system problems with you. He is prepared to offer complete system information, with advantages of each carefully weighed.

Ask him for Booklet B-4045, "Industrial Power Distribution Systems" and B-4162, "Power Centers by Westinghouse". Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60732

MAINTENANCE & OPERATION

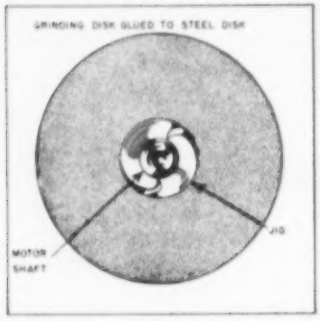
of buildings, utilities and facilities

Jig Centers Abrasive Disc

Contributed by James McGee, Allis-Chalmers Mfg. Co.

A JIG HAS been devised by the author to assure that the grinding discs glued to steel wheels of disc grinders are properly centered.

The jig centers the abrasive disc



The jig is so located that it is concentric with the hole through which the motor shaft will pass when it is in use

on the steel plate while it is glued in a press, thus assuring that the glued assembly will run concentric with the motor shaft. Prior to use of the jig, abrasive discs frequently shifted while being glued in the press. These off-center discs had to be discarded as their operation would be unsafe.

Are You a Heat Waster?

SOME plant engineers are losing money through heat losses from insulation faults which, if eliminated, can bring substantial returns on comparatively small investments. The Magnesia Insulation Manufacturers Association offers the following quiz to check on the efficiency of your insulation methods and materials.

Each "yes" answer rates ten points. "No" answers are zero. A score of 90-100 indicates a well insulated system; a score of 80-90 indicates only minor improvements are required; 70-80 shows the need for some major insulation changes; any score below 70 proves the need for a thorough survey by an insulation engineer.

1. Are all major pieces of equipment and piping insulated?
2. Are flanges, fittings and valves insulated?
3. Are condensate or hot water return lines insulated?
4. Has damaged insulation been repaired or replaced?
5. If insulation has shrunk excessively, exposing bare pipe at insulation joints, has it been repaired or replaced?
6. If insulation has deteriorated so as to impair its insulating value, has it been replaced?
7. Are insulation thicknesses economically based on today's fuel costs, insulation costs, operating temperatures, hours of operation, conductivity of insulation, and rate of deterioration of insulation?
8. Have special protective finishes been applied at points where mechanical abuse, excessive moisture or other hazard to insulation is likely?
9. Have repairs been made to torn, broken or otherwise damaged finishes?
10. Have loosened tie wires or bands been tightened and corroded tie wires or bands replaced?

Ring On Your Finger Can Ruin A Good Hand

Contributed by Richard Allen

IT MAY BE true that nothing dresses up a man's hand like a good looking ring but it's just as true that a ring worn on worker's hand during working hours can be a hazardous adornment. We became hep to this little but important fact after two employees lost fingers because of injuries that could have been avoided if they had not been wearing rings. In one case, a worker ascending a ladder caught his ring on a piece of equipment causing a deep cut that later became infected due to lack of first aid treatment. In the other case the ring caught on the handle of a pot of boiling parrafin and caused it

Tool Handling Speeds Up Work

Contributed by Gulf Oil Corp.

TWO OF THE many features at Gulf Oil Corp's. Research Laboratories at Harmarville, Pa. are the 5 ft tool cage in the machine shop and the tool rack placed at every milling machine for the purpose of speeding up work. The machine shop alone has 18,479 sq ft of floor space. A grinding room, where a large part of the laboratories' testing of thread grinding oils is conducted, is partially sound-proofed and is included in the row of special shops.

Next to the grinding room is a paint shop with explosion-proof fixtures and a high-suction spray booth. The electro-plating room, of original design, is a model of efficiency and has a tile floor, a blower-vent system for removing fumes, and suitable baths for practically any type of plating.

Welding and sheet metal work are carried out in another room.

Fig. 2. In the center of the main floor the tool cage has been held to a 5 ft height so as not to block view. The girl is no higher, apparently for same reason

★ DEMPSTER DUMPSTER SYSTEM

SERVING COST-MINDED MANAGEMENT FROM COAST TO COAST

. . . handling bulk materials of every description at phenomenal savings

Photos show the three simple stages of servicing a container. The Dempster-Dumpster, operated from hydraulic controls by driver in the cab, picks up each container and hauls it to point of disposition where it may be dumped or set down intact.

★ WVPPCO – *recognized across the nation*

. . . West Virginia Pulp and Paper Co., well known for sound management, uses the Dempster-Dumpster System

West Virginia Pulp and Paper Co. is among the hundreds of cost minded manufacturers, both large and small, using the Dempster-Dumpster System of bulk materials handling . . . the system recognized across the nation for its efficiency and ability to reduce costs.

Instead of operating several conventional trucks one truck alone can service any number of detachable containers, ranging up to 12 cu. yds. payload with the Dempster-Dumpster System. With this modern system of bulk materials handling, truck never stands idle to be loaded. One truck mounted Dempster-Dumpster, with only one man, the driver, is kept busy picking-up, hauling and dumping one pre-loaded container after another. Containers are spotted inside and outside your plant. They are built in a wide variety of designs best suited to the type of materials handled—be they bulky, light or heavy . . . solids or liquids . . . trash or rubbish.

The Dempster-Dumpster System cuts man-hours . . . reduces truck investment, gas, oil, maintenance costs . . . improves "housekeeping" methods . . . reduces fire hazards . . . provides an easier, quicker, safer and more efficient manner of handling materials. It will pay you to investigate the Dempster-Dumpster System now! A product of Dempster Brothers, Inc.

One Dempster-Dumpster Services All Containers. . . All Designs. . . All Sizes

DEMPSTER BROTHERS, 190 SHEA BUILDING, KNOXVILLE 17, TENNESSEE

Which of these Machines will Save You Money ?

These factory-assembled units of Pangborn Blast Cleaning and Dust Control machines are especially designed to earn extra profits where special equipment is not required.

BLAST CLEANING CABINET

cleans metal parts, removes rust, scale, grime, dirt, paint, etc., in a few seconds. Ideal unit for producing clean, smooth surface on pieces up to 60" x 36".

BLAST CLEANING CABINETS $290.00 and UP

BLAST CLEANING MACHINE

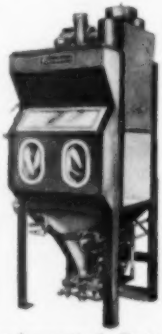
for maintenance and many other uses including the removal of rust, dirt, scale, etc. Economically cleans large objects such as tanks, bridges, structural work preparatory to painting. Six sizes, stationary or portable.

BLAST CLEANING MACHINES $155.00 and UP

UNIT DUST COLLECTOR

traps dust at its source, minimizes machine breakdowns, reduces housekeeping and maintenance costs. Solves many grinding and polishing nuisances and material losses.

UNIT DUST COLLECTORS $260.00 and UP



HYDRO-FINISH CABINET

uses liquid blast, eliminating dust, and reduces costly hand polishing, cleaning and finishing of molds, dies, tools, etc. Removes scale, discoloration and directional grinding lines, prepares surfaces for plating and coating. Holds tolerances to .0001".

HYDRO-FINISH CABINETS $1295.00 and UP

MAIL COUPON TODAY !

Look to Pangborn for the Latest Developments in Dust Control and Blast Cleaning Equipment

PANGBORN CORP., 3300 Pangborn Blvd., Hagerstown, Md.

Gentlemen: Please send me further information on—

☐ BLAST CLEANING CABINETS ☐ UNIT DUST COLLECTORS

☐ BLAST CLEANING MACHINES ☐ HYDRO-FINISH CABINETS

I am interested in the possibility of using one of these machines for.....

.....

NAME.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

Pangborn

to upset and burn the worker's hand so severely that infection started.

Those are only two examples of accidents caused by rings worn on the fingers of workers. The yearly total of finger injuries in all occupations is approximately 250,000, including about 25,000 permanent partial disabilities. Hidden away in these totals are plenty of finger injuries caused by rings. So if the safety rule book around your plant doesn't include a rule providing that "workers shall remove rings during working hours," we suggest that you give some prompt attention to the subject.

The hands of your workers play a tremendous part in the operation of your plant. Even a minor injury to one finger of a worker's hand decreases the degree of usefulness of that hand.

And since one out of four injuries in industry is to a hand, a ring on a worker's finger can often become a major contributing factor to an unnecessary accident.

Portable Ultraviolet Light Source

Contributed by Menlo Research Laboratories

FOR THE NON-DESTRUCTIVE testing of structures, weldments, vessels, and other objects too large for transport to a permanently-installed black-light booth, the new device shown here combines portability and self-powered operation with facilities to permit observation under the most intense ambient light. Total weight of the operating unit is less than 2 lb.

Two standard Size D flashlight batteries supply power for the ultraviolet generator which is attached

Quick determination of conditions of weldments and oher structures can be made with portable ultraviolet light

Corrugated clear PLEXIGLAS *panels, 42" x 60" x .125" are installed as large windows in the new foundry wing of DeLaval Steam Turbine Company, Trenton, N. J. The panels are lapped in with corrugated asbestos sheets of the same corrugation and are bolted directly to these panels. This sash-free installation and the shatter-resistance of* PLEXIGLAS *emphasize its value as a glazing medium in initial construction and long-term maintenance.*

"Slamming, Jolting Trucks Smashed Windows Wholesale . . .

UNTIL WE GLAZED WITH PLEXIGLAS"

Shown here is what used to be a "high breakage area" in the DeLaval Steam Turbine Plant. Trucks and other mechanical equipment continually smashed glass in doors and windows—kiting maintenance costs and accident hazards—until PLEXIGLAS glazing was installed. Now management reports replacements practically zero.

Wherever window breakage is a safety problem—or maintenance costs are high—you need PLEXIGLAS. It takes a hard, direct blow to break this tough acrylic plastic, and even then it does not shatter. And because of its lightness, PLEXIGLAS can be installed quickly, safely and with a minimum of support—even in large-area openings.

In industrial plants, housing projects, schools and hotels, PLEXIGLAS is paying for itself over and over again in savings on glazing replacements. Put this *Outdoor Plastic* to work for you. Write today for full details of optically clear, patterned or corrugated translucent PLEXIGLAS for glazing.

SEND FOR FREE DETAILS NOW

"GLAZING WITH PLEXIGLAS" gives interesting details on applications, workability and economies. Get your free copy today.

PLEXIGLAS *is a trade-mark, Reg. U.S. Pat. Off. and in principal foreign countries.*

Canadian Distributor: Crystal Glass & Plastics, Ltd. 56 Duke Street, Toronto, Ont.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

1/4" 5/16" 3/8"
1/2" 5/8" 3/4"
and 7/8" capacity

Electric Drills

powerful! cool running! light weight!

15 MODELS . . . A TYPE AND SIZE FOR EVERY JOB

Whatever your drilling requirements — occasional small jobs — general intermittent operations or continuous heavy work — Snap-on can furnish the best drill to fit your purpose. Superior features include heavier and more powerful motors than many competitive tools of similar chuck capacity . . . extremely efficient cooling . . . helical gears throughout . . . all ball bearing construction permanently lubricated and sealed from dust and grit . . . heavy duty Jacobs chucks . . . extra long (15 feet) heavy 3-conductor cable treated to withstand oil, grease and wear. Shipments made promptly from Snap-on branch offices located in 40 key industrial cities . . . write for complete catalog.

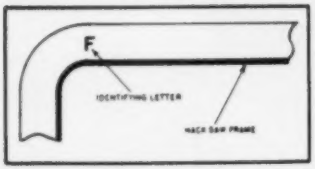
Blue-Point general purpose, straight shank, high speed drills available in fractional sizes from 1/16" to 1/2"; Wire Gauge Drills from No. 1 to No. 60.

SNAP-ON TOOLS CORPORATION

8068-I 28th Avenue
Kenosha, Wisconsin

by a swivel joint to the wand-type handle containing power components. A light-tight dark chamber fits around the generator head to exclude light from the area under examination. A sponge rubber cone improves the light seal on rough or irregular surfaces. A series of specimen-holding end caps fits the mouth of the dark chamber so small objects can be examined without removing them to a darkened area. A focussing eyepiece provides 3 times magnification for the observer.

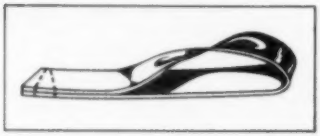
Marking Hacksaw Frames



Where two hack saw frames are employed, one with a coarse tooth blade for regular work and the other with a fine tooth blade for cutting thin material, time can be saved in the selection of the proper saw by marking an identifying letter on each hacksaw frame

Belt Ends Match With a Single Turn

THE "OLD METHOD" OF cutting a belt was to cut each end by itself after having first squared-up the line of cut with a square. By making a single turn in the belt, placing the square or straightedge on the top layer and making the cut, the resulting ends will, when the belt has been un-twisted, match perfectly.



Square up the ends of the belt and make a straight cut. The two resulting ends will match when belt is turned

It is, of course, better to make the cut as square as possible in order to save on belting material. But even an angular cut as shown by the dotted lines in the sketch will still give a perfectly matching pair of ends.

New Air Mill Reduces Talc to Submicron Size

Contributed by General Electric Co.

GOUVERNEUR TALC CO. in upstate New York is turning out 200 tons a day of talc reduced to micron and submicron sizes in an unusual type

Where do YOU want to save money?

MASONITE HARDBOARDS

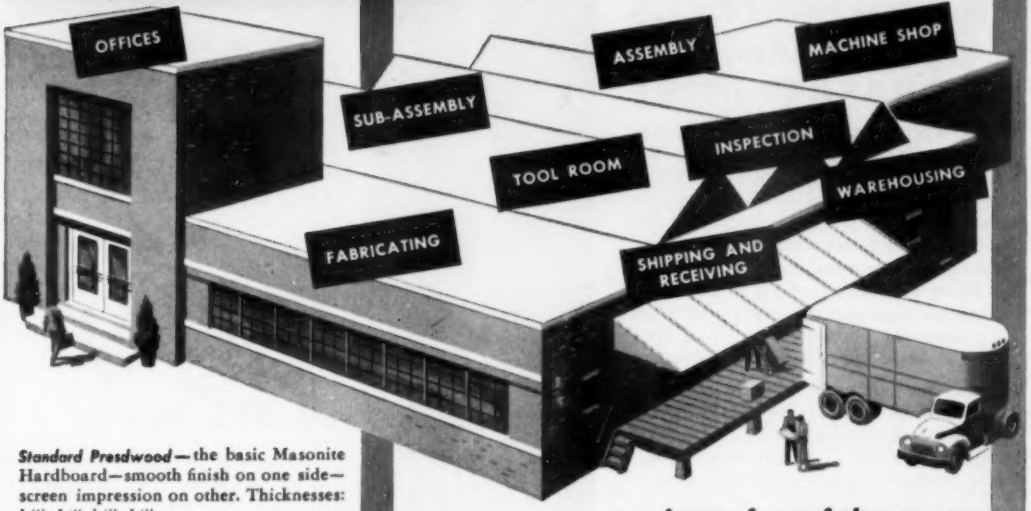
can cut maintenance costs all over the plant!

Put the big family of Masonite Hardboards to work in your plant—then start counting the money you save in upkeep.

Masonite Hardboards were born to take punishment. Made of exploded wood fibers, with no artificial binders or fillers added, they show amazing structural strength—resist scuffing, denting, abrasions, moisture and weathering. They cut easily to any size or shape with ordinary tools. They take and hold beautiful finishes.

These hard, dense panels are available in 19 different sizes and thicknesses through lumber dealers—offer hundreds of ways to save maintenance money, boost production, increase safety, add to employee comfort.

We'll be glad to tell you how and where you can use each type of Masonite Hardboard to your best advantage. Fill in and mail the coupon today.



Standard Presdwood—the basic Masonite Hardboard—smooth finish on one side—screen impression on other. Thicknesses: 1/8", 3/16", 1/4", 5/8".

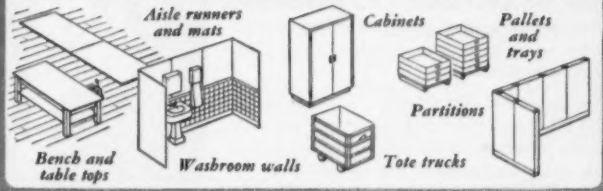
Tempered Presdwood®—tempered to extra hardness, greater strength, abrasion and moisture resistance. Thicknesses: 1/8", 3/16", 1/4", 5/8".

Panelwood®—a low-cost panel material for walls and ceilings. 3/8" and 1/4" thick.

Temprtile®—tempered for durability and moisture resistance. Score lines form a 4" tile pattern. 1/8" thick.

just a few of the ways

MASONITE HARDBOARDS *can trim costs*



MASONITE®

CORPORATION

Masonite Hardboards are available through your Local Lumber Dealer

MASONITE CORPORATION
Dept. PE-9, 111 West Washington Street, Chicago 2, Illinois
Please send information about plant uses of Masonite Hardboards. I am interested in

.....

Name.....

Address.....

City and Zone.....*State*.....

Fast Acting Fire Watchman

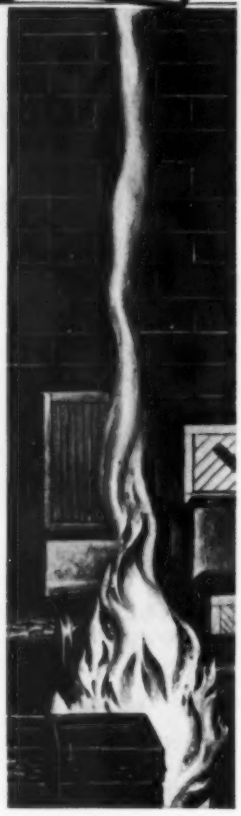
on duty 24 hours a day...
AT EACH FIRE HAZARD POINT

Let C-O-TWO safeguard your property from fire, even if you have a night watchman on duty. With a C-O-TWO Combination Smoke Detecting and Fire Extinguishing System you have an automatic, round-the-clock fire watchman that simultaneously guards each fire hazard point. The first trace of smoke in a protected area is drawn through pipes to a smoke detector. Immediately an alarm sounds . . . then fast, clean carbon dioxide gas fully floods the stricken area . . . the fire is out before it has a chance to spread and cause extensive damage.

Actual fire tests made by the Underwriters' Laboratories, Inc. show that fire detection with this type of smoke detecting equipment is much quicker than other methods . . . because usually there is smoke or smoldering before flames break out.

There is no water damage, no lingering odors with carbon dioxide . . . only damage is that actually caused by the fire itself. Carbon dioxide is clean, dry, non-conducting and non-damaging . . . harmless to finishes, materials and equipment. The fire is out in seconds, with hardly any interruption or commotion.

Remember fire doesn't wait . . . let an expert C-O-TWO Fire Protection Engineer advise you on your fire protection needs now, before fire strikes. Write today for complete free information!



C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY
Sales and Service in the Principal Cities of United States and Canada
AFFILIATED WITH PYRENE MANUACTURING COMPANY

of airpowered pulverizing mill with no moving mechanical parts.

Crushed rock enters the mill through a venturi-injection system, and is picked up by blasts of hot compressed air and set in motion. Talc particles in the mill circulate at high velocity and bombard each other causing almost complete disintegration.

Although there are only a few pounds of talc in the mill at any time, the speed is so high that as much as 6 tons will pass a given point in a minute. Each time a particle circulates about the chamber it becomes smaller, and it may require as many as 1500 to 2500 round trips before it reaches the proper size. Compressed air is furnished by an Ingersoll-Rand compressor which is driven by a General Electric 1750-hp, 4160-v synchronous motor under wide load variations.

Expediting Wood Screws

WHENEVER IT IS necessary to drive wood screws into hard or tough wood, turning effort can be substantially reduced and the danger of

Soap as a lubricant for screw threads

breaking the screwdriver slot or twisting off the screw can be eliminated, simply by scraping the threaded portion of the screw across a small bar of soft or moistened soap before starting to drive the screw into the wood.

Fundamentals of Hard-Facing

Contributed by Linde Air Products

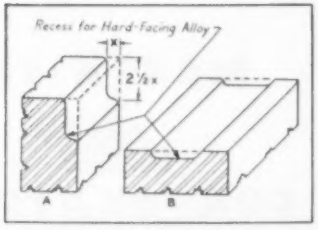
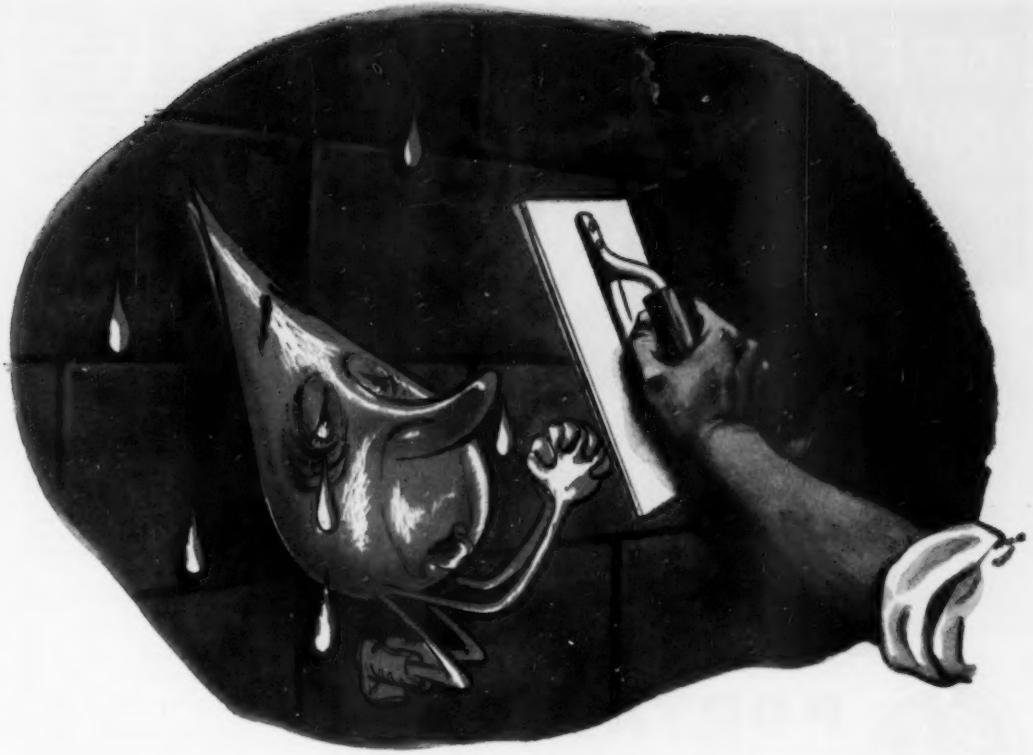


Fig. 1. All loose scale, dirt, rust or other foreign substances must be removed from the areas to be hard-faced,



How to Humiliate Humidity...

There are few intruders more persistent than unwanted moisture. One of the best ways to bar the door against it is to specify Flintkote Trowel Mastic on the interior face of exterior walls.

Here is a list of specially formulated asphalts for the many different applications necessary in moisture control. Cutbacks and emulsions . . . mastics, semi-mastics and fluids . . . hot-applied, cold-applied . . . fibrated, non-fibrated . . . spray-, brush-, and trowel-applied . . . whatever the characteristics, you can be certain that when you specify Flintkote, you're getting high quality products *especially developed* for your needs.

No matter what the job . . . above grade, or below . . . inside or out . . . you get proven performance when you specify the Flintkote line. It's a really effective way to humiliate humidity.

FLINTKOTE PRODUCTS FOR PROTECTION AGAINST WATER AND DAMPNESS

ASPHALT PRIMERS • ASPHALT CUTBACK COATINGS TROWEL MASTICS • SEMI-MASTICS • HYDRALT* EMULSION PROTECTIVE COATINGS • CAULKING COMPOUNDS • ASPHALT SATURATED MEMBRANE • SPANDREL CLOTH

Complete specifications and application data are available. Write for them today.

*Reg. U. S. Pat. Off.

THE FLINTKOTE COMPANY, *Industrial Products Division*
30 Rockefeller Plaza, New York 20, N. Y.
Atlanta • Boston • Chicago Heights • Detroit • Los Angeles
New Orleans • Washington • Toronto • Montreal

FLINTKOTE *Products for Industry*

GETS ELECTRICAL FACTS DOWN ON PAPER!

PORTABLE RECORDER

Type CF-1

LIST PRICES FROM $110

With this G-E portable recorder you can get electrical facts easily—recorded in permanent form. Voltage surveys will provide data for improving lighting circuits where voltage variations are excessive. You can record motor currents, and forestall overloading or underloading. In many types of electrical investigations, this recorder can help you get the facts.

CF recorders are inkless—no problems of spilling or re-filling. They are light in weight, easily set or hung in place. They can be used indoors or out; extremes in temperature will not affect accuracy. A variety of chart speeds can be obtained; the recorder can run as long as 30 days without requiring a change of the record roll.

CF portable recorders are available in a number of types: a-c or d-c, voltmeters, ammeters, wattmeters, etc. For this and other G-E testing instruments see your local G-E distributor, or write Apparatus Department, General Electric Company, Schenectady 5, N.Y.

GENERAL ELECTRIC

602-170

preferably by grinding or machining. When the hard-facing material is to be applied to a groove or recess, it is important to round off all corners as shown in the drawing; this will help prevent local overheating of the base metal. Finish ground dimensions of the alloy which will fill the prepared recess are indicated by dotted lines

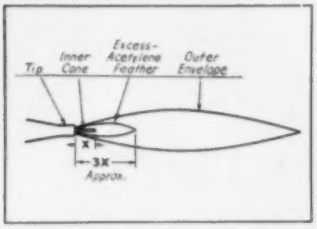


Fig. 2. Adjust the flame so that it has an excess of acetylene, with a bright secondary flame or feather surrounding the inner cone. For hard-facing with alloy rod this feather should be three times the length of the inner cone. If an excess acetylene flame is not used the alloy will not spread uniformly and may become porous in its structure

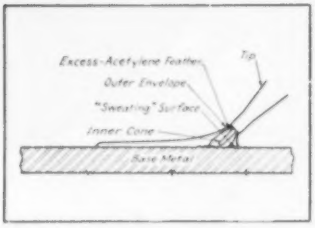


Fig. 3. Bring the inner cone about 1/8 in. from the surface to be hard-faced. Heat a spot until it suddenly becomes glazed, showing that an extremely thin surface layer has been melted. This condition, known as "sweating," must be present before alloy hard-facing rod is added. The "sweat" area will extend for a distance of about 1/4 in. around the acetylene feather of flame

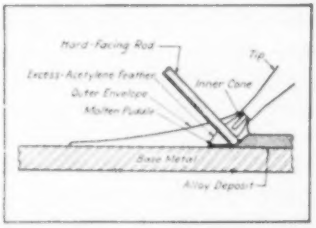


Fig. 4. Next, carry the rod into the flame so that the tip of the inner cone just about touches the rod and the end of the rod lightly touches the sweating metal. Melt just enough rod to form a puddle on the surface of the sweat area. Then withdraw the rod and spread the puddle with flame. Do not stir it with the rod. Melt off more rod as it is needed. With a little practice it is possible to work continuously by pointing the flame partly on the puddle and partly on the base metal next to it

This ROOF stays up... its cost stays down!

Applying batten seam Monel roof on new Ford Motor Company research building. Entire roof is Monel.

Monel Roofing Sheet gives you roofs and roofing parts that are good for the life of the building. Yet their cost is surprisingly low.

How many times have you wished for a metal that would just about eliminate roofing repairs?

Then take a tip from major industrial organizations who have found, and installed, such a metal.

The metal is *Monel** . . . an alloy consisting of approximately $\frac{2}{3}$ nickel and $\frac{1}{3}$ copper.

Men who know metals, can tell you that Monel is 100% rustproof and highly resistant to corrosion by acids, alkalis and salts. This explains why Monel roofing survives so well in atmospheres contaminated by smoke, salt air and industrial fumes.

That corrosion resistance is backed up by the high mechanical properties you need in a roofing metal. Monel resists severe stresses and wear. It doesn't buckle or crack at extreme temperatures.

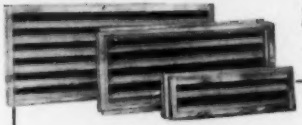
Monel provides a way to drastically cut your yearly outlay for roof maintenance. The proof is in its past performance. Monel roofing installations date back to 1910 . . . and they are *still in good condition!*

Before you install any part of a roof, investigate Monel. Because of its strength and workability, its installed cost is reasonable — even surprisingly low.

Send for booklet, "ONE METAL ROOF"

It shows typical installations, tells about Monel's many advantages, cites long-service records. Included is a "test-it-yourself" sample of Monel Roofing Sheet.

*Reg. U. S. Pat. Off.

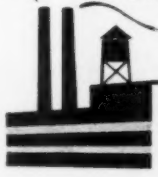


MONEL *cuts Louver Sheet Thickness 25%*

Here's how Monel makes possible substantial reductions in the sheet thicknesses used for standard roofing parts. A large corporation needed 50 louvers in assorted sizes. By specifying Monel (with its superior corrosion resistance and high mechanical properties), it was possible to reduce the sheet thickness. Result: longer-lasting, economical louvers . . . and a 25% saving in weight. Remember, "Monel Roofing" is a broad term; it includes entire roofs as well as drainage systems . . . flashings . . . skylight frames . . . ventilators . . . louvers . . . siding . . . expansion joints . . . copings.

MONEL ROOFING

For the "Life-of-the-Building"



EMBLEM OF SERVICE

INCO TRADE MARK

Architectural Section
The International Nickel Company, Inc.
67 Wall St., New York 5, N. Y.

Please send me a copy of "ONE METAL ROOF" and the sample of Monel Roofing Sheet.

Name.....

Title.....

Company.....

Address..... PE 9-50

City..... State.....

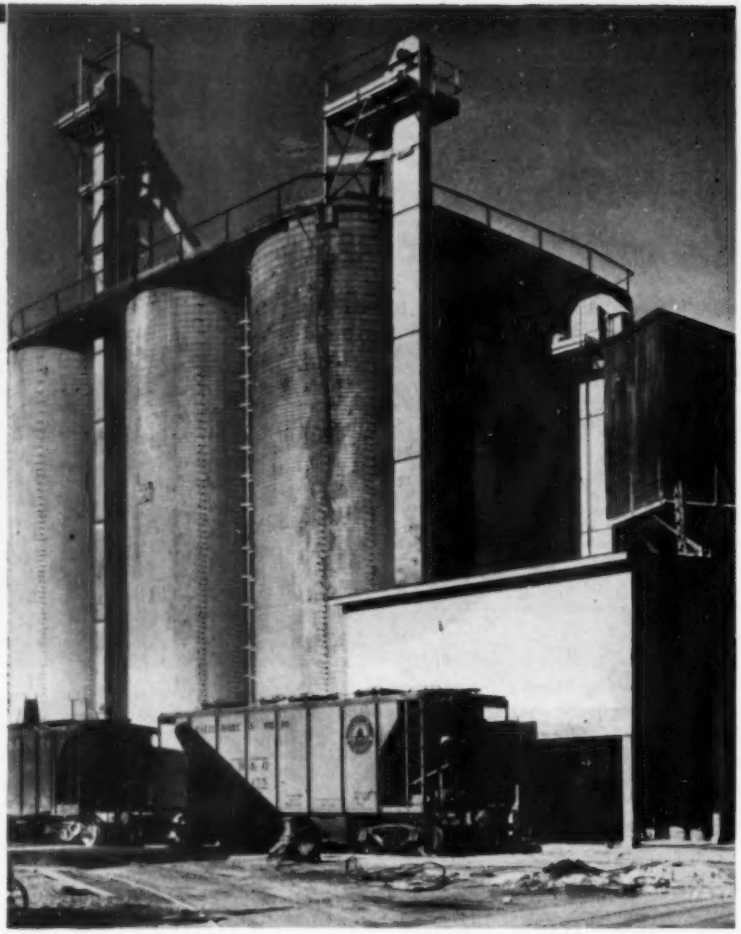
THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

JEFFREY BUCKET ELEVATORS

New Improved Design

- Welded Angle Casings —heavy gauge steel Dust tight—Water tight
- Improved Head and Boot Sections
- Increased Bearing Protection
- Removable Hood
- Large Clean-out Doors both sides
- Large Inspection Doors for access to chain and buckets
- Take-ups furnished for Head or Boot if desired—self-aligning, plain or anti-friction bearings



Jeffrey Car Puller is shown in foreground.

These are only some of the features incorporated in our Standard Bucket Elevator line. A type and size to meet any requirement. Complete drawings available. Jeffrey Bucket Elevators are backed by years of engineering experience and hundreds of installations. May we hear from you?

Chains • Conveyors of all kinds • Feeders • Car Pullers • Bin Valves • Dryers and Coolers • Packers • Skip Hoists Screens • Crushers and Pulverizers Belt Idlers • Transmission Machinery Replacement Parts

THE JEFFREY MANUFACTURING COMPANY Established 1877

905 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

Baltimore 2	Chicago 1	Detroit 13	Jacksonville 2	Pittsburgh 22
Birmingham 3	Cincinnati 2	Harlan	Milwaukee 2	St. Louis 1
Boston 16	Cleveland 13	Houston 2	New York 7	Salt Lake City 1
Buffalo 2	Denver 2	Huntington 19	Philadelphia 3	Scranton 3

Jeffrey Mfg. Co., Ltd., Head Office & Works, Montreal

Announcing—

BullDog Unit-Versal Vacu-Break Switchboards

Completely interchangeable, flexible Service and Distribution sections to meet every immediate and future need.

New Unit-Versal Vacu-Break Switchboards provide unequaled *flexibility* and *interchangeability* plus the exclusive Vacu-Break principle of arc control for longer switch life. Write today for Bulletin 496. It contains complete information on these remarkable, new switchboards.

BULLDOG ELECTRIC PRODUCTS COMPANY
DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

Simple to wire. Only a screwdriver and crescent wrench are needed to assemble, install, extend or convert these modern switchboards. Removable front plates provide quick access to large wiring gutters at top, bottom and both sides.

Large mounting space. More than 5½ feet of vertical mounting for branch circuits. Blank filler plates cover unused space and allow for future unit additions. All sections and units can be interchanged quickly and easily.

Complete Distribution Sections. Distribution Sections accommodate the full range of interchangeable ET Circuit Breakers and fusible Vacu-Break switch units—15-ampere to 600-ampere capacities.

Complete Service Sections. Service Sections include space only for meter and current transformer. They also include riser bus and Main ET Circuit Breaker or Fusible Vacu-Break Switch in capacities of 225, 400, or 600 amperes or Main Air Circuit Breaker of 800-, 1200-, or 1600-ampere capacities.

Extremely flexible. New Unit-Versal Service and Distribution sections may be used individually or combined into multiple-section switchboards. Sections may be added or removed as needed.

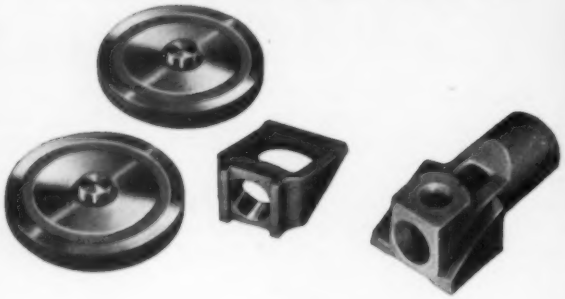
Vacu-Break Switch Units or ET Circuit Breakers (as indicated) may be used as Mains in Service Sections. Vacu-Break Switch Units are Horsepower-rated and approved by Underwriters' Laboratories.

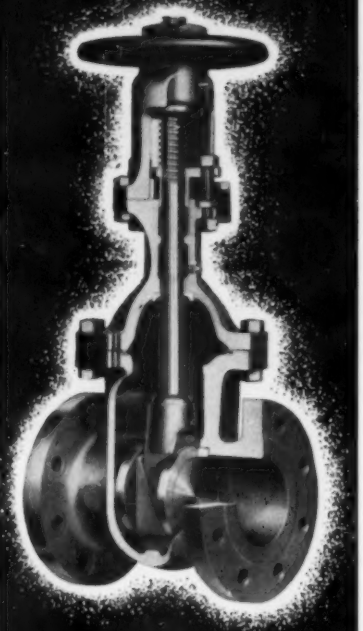
BULLDOG

PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

How Darling features prevent trouble and expense

Simplified Maintenance





DESIGNED for extreme simplicity, with all parts interchangeable, Darling Fully Revolving Double Disc Parallel Seat Gate Valves assure easy inspection and unsurpassed maintenance economy.

There they are—just four simple gate parts, two plain discs and two wedges . . . readily and quickly removed or replaced as a unit, without disturbing the valve body. Moreover, since the discs are entirely independent and interchangeable, new discs can be installed without laborious bench work or fitting. Likewise, seat rings are made with lugs for easy removal and replacement without removing the valve body from the line.

Extra deep stuffing boxes provide ample packing space. Independent gland bolts permit adjustment or replacement of packing without disturbing the stuffing box bolts.

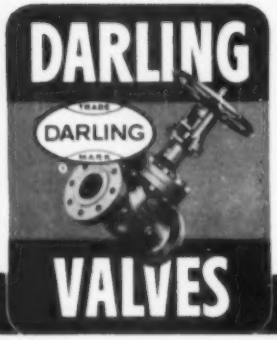
Finally, *all* Darling Gate Valve parts are made to established engineering standards, beginning with rigid metallurgical specifications, then controlled all along the way with gauges and templates for complete dimensional accuracy.

So for low maintenance cost and minimum parts inventory, for long-range economy in *every* way, specify Darling Fully Revolving Double Disc Parallel Seat Gate Valves.

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

*This advertisement is one of a series showing how the unique Darling Fully Revolving Double Disc Parallel Seat Gate Valves answer the following critical operating problems:

- **Positive, easy closing—regardless.**
- **Automatic adjustment for valve body distortion.**
- **Elimination of disc-to-seat friction and galling.**
- **Uniform wear distribution.**
- **Extreme simplicity.**
- **Greater service life.**
- **Simplified maintenance.**

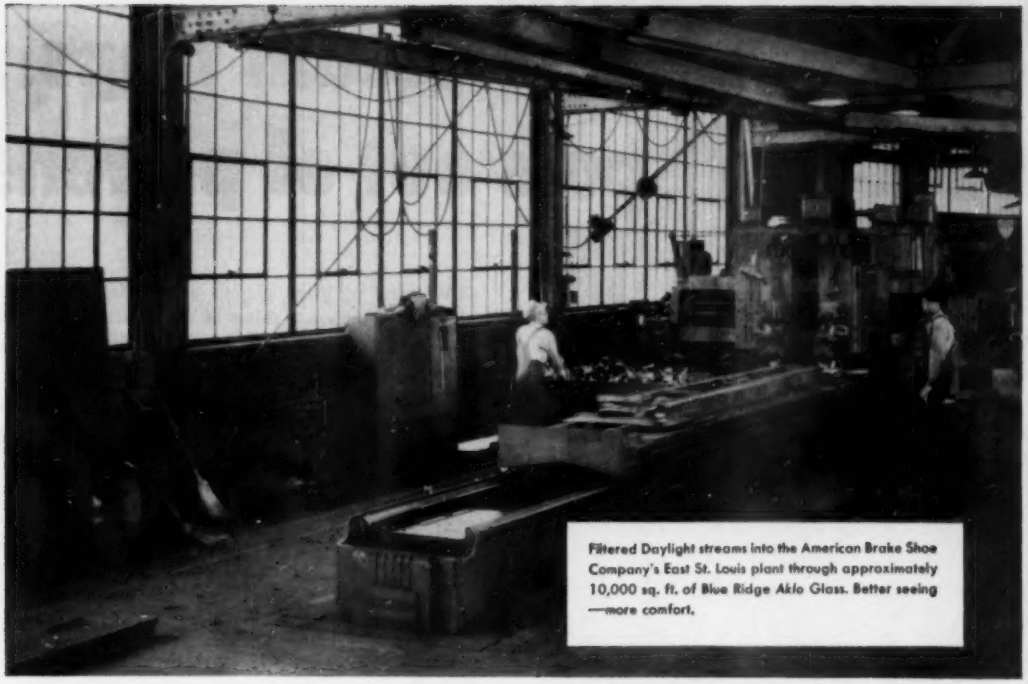


Outline your service requirements and get complete information on Darling Valves of the proper type. Or, send for the complete 300-page Darling Catalog No. 17M. It describes Darling Valves of all types for every normal or unusual service, and for pressures up to 1500 pounds. It's full of helpful information . . . Yours for the asking.

CORROSION RESISTANT VALVES

In addition to conventional iron, bronze and steel constructions, Darling specializes in valves for any corrosive fluid: iron body valves with special alloy trim; iron body, rubber lined, with special alloy trim; all bronze; and all special alloy. Darling's 50 years of experience in meeting unusual requirements is always at your service.

THE VALVE MARK OF QUALITY . . . WATCH FOR IT



Filtered Daylight streams into the American Brake Shoe Company's East St. Louis plant through approximately 10,000 sq. ft. of Blue Ridge *Aklo* Glass. Better seeing —more comfort.

More restful seeing . . . more comfortable working with FILTERED DAYLIGHT

There's more to daylighting than providing just a lot of it . . . for best seeing conditions bring in *well-diffused* daylight through large areas of Blue Ridge Frosted *Aklo** Glass. This blue-green glass acts like huge sun glasses between the eyes of workers and direct sun or bright sky. Less glare . . . less eye fatigue . . . better workmanship and fewer accidents.

More comfort, too. *Aklo* Glass absorbs sun heat and re-radiates much of it back outdoors. It excludes three times as much sun heat radiation as does ordinary glass! Interiors stay cooler in direct sun. More comfort . . . less load on air conditioning. *Aklo's* heat reduction permits the use of larger glass areas for the kind of daylighting you want.

Aklo is made by the Blue Ridge Glass Corporation of Kingsport, Tennessee, and sold by Libbey-Owens-Ford glass distributors. To see for yourself how Frosted *Aklo* Glass reduces glare and sun heat, ask your distributor for a Radiometer demonstration. *®

Free Book on Reduction of Sun Glare and Heat

Blue Ridge Sales Division
Libbey-Owens-Ford Glass Company
9395 Nicholas Building, Toledo 3, Ohio

Please send me a copy of your book on glare and heat reduction, "Filtered Daylight".

Name _____

Company _____

Address _____

BLUE RIDGE GLASS CORP. KINGSPORT, TENN. QUALITY GLASS

BLUE RIDGE AKLO GLASS

Heat Absorbing • Glare Reducing • Figured and Wire Glass

LOF GLASS

HOTTER, SOONER steam traps.. knock cold spots out of platens

Cold spots in press platens at this large western plywood plant are a thing of the past since they've installed the steam traps that get equipment *hotter, sooner*—Yarways.

Yarway Impulse Steam Traps never allow condensate to accumulate and pull down working temperatures. They discharge the condensate *as fast as it forms.* Result—equipment always operates at highest efficiency.

Couple this fact with other features like small size, easy installation, only one moving part, non-freezing, good for all pressures, low cost—and you know why more than 650,000 Yarway traps have already been installed.

Try a Yarway *for free* in your own plant. Your nearest distributor will supply it. For name, or free bulletin write to . . .

YARNALL-WARING COMPANY

145 Mermaid Ave., Philadelphia 18, Pa.

Stainless Steel Body

YARWAY IMPULSE STEAM TRAP

Plan*gineering*

● **Rubber Handler**—An improved method of preparing rubber for wire insulation is in operation at the Port Huron, Mich., plant of The Electric Auto-Lite Co. A new strainer-extruder unit prepares the rubber in a form better suited for further preparation as insulation. Then a series of conveyors eliminates further handling of the heavy rubber batches prepared by the mixer. This photo shows the sheeted rubber traveling up a chain conveyor for further cooling and then to a rotary knife where it is automatically cut to size and palleted for easy handling.

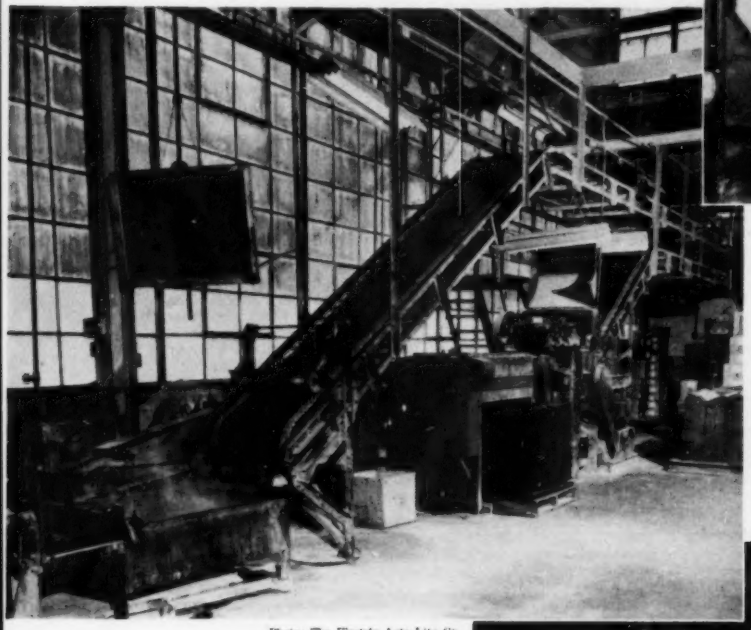


Photo: The Electric Auto-Lite Co.

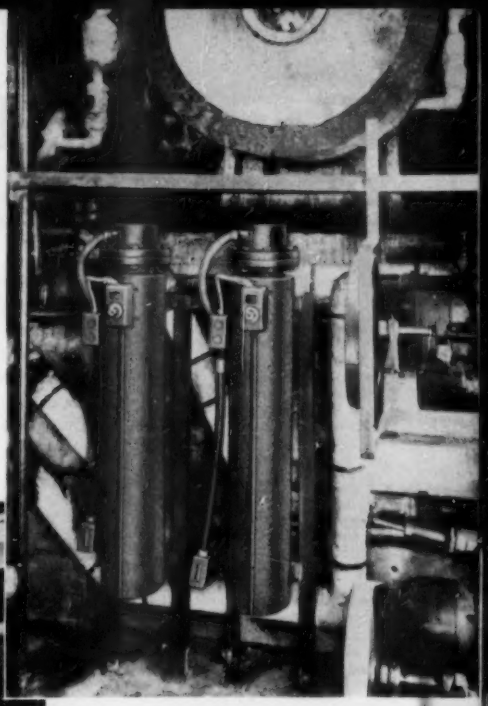


Photo: Edwin L. Wiegand Co.

● **Oil Heaters**—Light fuel oils which can readily be pumped at ordinary temperatures are being replaced, even in the smaller plants, by heavier, lower cost grades of higher heating value. These heavier oils need preheating to facilitate flow and one of the latest methods of applying this heat is by the use of electric circulation heaters either at the storage tank or at point of use. Typical installation, shown here, is at power plant of Polk Sanitary Milk Co., Indianapolis.

● **Up She Goes!**—Why bother to move the work when it's a lot easier to move the conveyor, too? Engineers at Westinghouse Appliance Division, Mansfield, Ohio, asked this question and also came up with the answer. Shown in the photograph at right is a tiltable conveyor section refrigerator in the assembly line. This section permits the operator of a gun spot welder to weld the bottom pan in a refrigerator cabinet without stooping or lifting the cabinet. A foot valve controls the air cylinder shown at lower left.

Photo: Westinghouse Electric Corp.

War Clouds and the Plant Engineer's Job

How military preparations affect industrial operations . . . Why the plant engineer is a key factor . . . Where the first effects will be felt . . . When planning should start . . . What changes heavy defense department expenditures and increased foreign aid will make in the industrial pattern . . . Changes require planning, rearrangement, longer hours, shifting utility requirements, heavy maintenance loads, untrained personnel, added fire and accident hazards . . . Rough Times are ahead

UNDER FIVE YEARS of peace, liberally laced with Cold War, repressed Consumer Demands and Foreign Aid, American industry went into high gear. Production, industrial expansion, savings, employment and profits hit new highs. The potion is heady, perhaps even Burke's "opiate potion of amnesty" which obscures the realities of war.

Plant engineers, in fact all engineers, are still reeling under the demands placed upon them during this period of rapid change, reconversion and expansion. Change spells grief to the engineer. Korea, too, spells grief but this time in capital letters.

Guns warning of the invasion ended the Cold War. The present status is indeterminate. We must be prepared for total war and equally well prepared if that war does not come. In this we must not bankrupt our economy to play Russia's game and so lose by default. War may not be inevitable but the decision is not ours. The USSR is calling the tune, a tune of World Domination that has not changed in more than 40 yr since the revolution. Last month Stalin played the same record over the radio to the world—WHEN Communism has conquered the world there will be but ONE world language.

The consensus of experts is that Russia is not yet ready for War. The only military weapon in which America excels is industrial capacity. Overall, the Soviets have not equalled this. They will not do so for maybe 2-3 yr. Secretary Acheson last year said 5 yr. After Korea, however, Senator Taft said that at best we must look forward to a period of 10-15 yr as a semi-military state. This means high military budgets and increased demands on industry.

Experts may or may not be right. Regardless of this the plant engineer must be prepared to meet any eventuality. In this connection, there is a great deal of information which a plant engineer can obtain, and which he should have, to permit him to look ahead, judge the changing situation, plan his own work and cooperate more effectively with, perhaps even ahead of, his management group.

What will military procurement mean to industry in general? How will it affect materials, manpower and facilities? How will this war work be distributed? How will it affect a particular industry? A particular plant? Some of these are general, some can be answered only in relation to particular conditions or individual circumstances.

Coming at a time when employment is already at record peak on civilian work, at a time of low inventories, rising prices and shortages of many materials, the impact of this increased military procurement on the manufacturing industries will not be long delayed.

Approximately 40 per cent of the military budget goes into equipment and supplies, not including food and clothing. The regular 1950 budget plus emergency appropriations now total over $30 billion of which the manufacturing industry will absorb perhaps $12 billion. For comparison, this approximates the 1950 capital expenditures by all business (with the exception of utilities) for 1950. Procurement for the civilian government agencies will probably increase this by 50 per cent.

Steel is probably the most important factor at the moment. In spite of record steel output approximating 100 million tons annually, there have been serious shortages in this commodity since spring. Even without government controls, a voluntary industry allocation program is inevitable in the near future. Companies using large quantities of steel in non-essential uses and luxury items will soon begin to feel the pinch of military procurement.

Apparently the lessons of World War II have not been entirely forgotten for many far-sighted companies have already taken steps to protect their position by government work. During the early days of the last war there was a reluctance among small companies to engage in war work. In many cases this reluctance continued until a shortage of materials ended the profitable civilian business. A new start in war work was a long, hard pull for many. Learning the ropes takes time.

How does this Federal government money get into industry? In normal times through what is known as current procurement by some 20 government agencies. The military agencies alone buy 3,500,000 different items through 55 primary procurement offices on contracts of $1000 and over. Practically every government office or military post makes what is known as local purchases of $1000 and under.

Large scale emergency military procurement however is apt to follow a different pattern. In World War II nearly 70 per cent of the total, on a dollar basis, was awarded as prime contracts to 100 corporations. Prime contractors are those holding contracts directly with the government. In general,

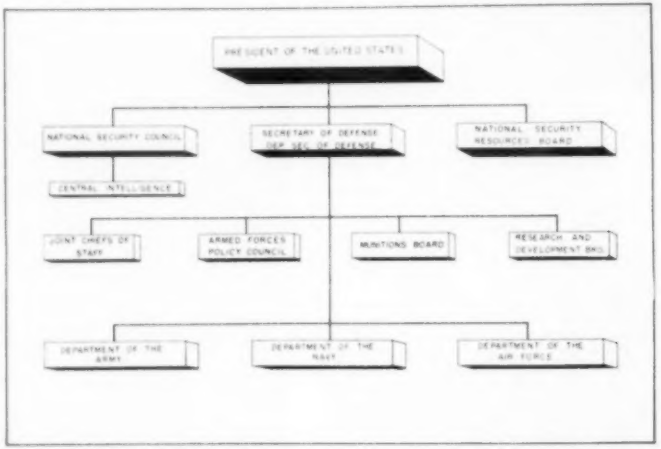


Fig. 1. As time goes on, the above agencies will play an increasingly important role in industrial work and in the daily news. They cover the organization for national security as set forth in the National Security Act. In case of war emergency, the NSRB is the streamlined version of the old War Production Board

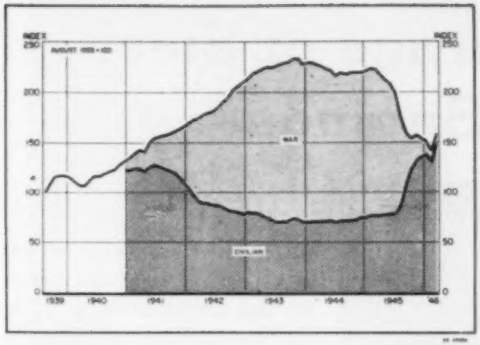


Fig. 2. The history of military and civilian production during World War II. For specific industries, ratios vary, but for general planning purposes it is assumed that half of the peace time output of a plant will be allocated to civilian requirements. The other half plus increases due to longer hours and extra shifts will be devoted to military requirements

approximately 50 per cent of the prime contract work is sub-contracted, and on large contracts this may extend down several steps.

For immediate business, sub-contracting is preferable. This is particularly true for companies lacking experience in prime contract work. From the government standpoint it is the quickest and most effective method of spreading defense work.

Since 1945, there have been many detailed changes in military procurement as a result of the National Security Act, or as it is popularly called the Unification Act. The present organization is shown by Fig. 1. The National Security council is advisor to the President on overall domestic, foreign and military policy. For information and background data they have the Central Intelligence Agency.

The National Security Resources Board may be considered as a policy implementing agency for the coordination of military, civilian and industrial activities or needs. In wartime it will be of major importance, the modern counterpart of the War Production Board. The Munitions Board performs much the same function for the military agencies; administers the stockpiling program; and is also the key factor in the Industrial Mobilization Program.

In broad strokes, this is a prior planning program aimed at "buying time" in a war emergency by: 1, determining what we will probably need; 2, finding out who can make it; 3, detailing plans for future production; and 4, helping the companies involved.

For those interested in prime contracts for current procurement, as contrasted to sub-contracting and Industrial Mobilization Planning mentioned above, the 55 principal procurement agencies and their branch offices must be investigated.

These offices know what their agencies are currently interested in, have copies of the bid requests, can supply specifications and will give data on prices paid for previous purchases of the same item. They know who to see if you have a product not quite within specification, or, have a new product which you feel has an application.

In many cases they have a price analyst who can give a good approximation of what an item should cost, and, a member of the Small Business Liaison Committee concerned primarily with offering advice and assistance to the smaller companies. Small businesses, according to government agencies, are companies of less than 500.

Because of political pressure all government agencies give them preferred attention, but the law of the land says that, except in rare and specific instances: the government must buy from the lowest bidder; must buy according to a very rigid and inflexible procedure; and, that the bidder must finance the contract.

What does this mean to the plant engineer? Excepting the obvious relation to the continued prosperity of his company, it means that change is ahead. Even under present conditions, Uncle Sam will require from 10 to 20 per cent of the nation's productive capacity.

Some of this will fit in with present production. Much will not. The changes fall upon the plant engineer's shoulders. A few fortunate individuals, working with the Industrial Mobilization Program, know and have planned for these changes. Many have not. There will be the problem of physical plant changes, added personnel with serious space limitations, longer hours and more shifts, parking lot and guard force problems, new handling and utility problems, maintenance difficulties and the safety hazards of new personnel.

On the other side of the ledger thought must be given to blackout requirements, air raid drills, panic control of personnel, bomb demolition training, dispersion of industry, fire control, and, as a matter of more than passing interest, the atomic bomb. These are the plant engineer's problems. Future articles will cover these problems.

If Your Company is Interested in Doing Business With Uncle Sam

1. Write to the Central Military Procurement Information Office, Room 3D760, The Pentagon, Washington 25, D. C., for copies of the three Procurement Guides. There is one each for the Army, the Navy and the Air Force. These Guides deal with current procurement. They tell what is bought, where it is bought and how it is bought.

2. Write to the Munitions Board, Small Business Division, Room 3D760, The Pentagon, Washington 25, D. C., for copies of Munitions Board Manuals No. 90-1 and 40-1. These deal with the industrial mobilization program planning for emergency procurements. With the exception of a few study contracts for very strategic items no current procurement is involved. It is largely a cataloging of facilities and capacities for use by the armed services in case of complete mobilization. Field offices are listed in Appendix X of 40-1.

3. Write to Chicago Field Office, U. S. Department of Commerce, Room 1050-322 South Michigan Ave., Chicago, Ill., for: (1) The address of your closest Dept. of Commerce Field Office where there is on file a manual listing all items and all procurement agencies for all government agencies; (2) The location of your closest agency having on file daily "Synopsis of Government Procurement Information" and (3) the weekly "Consolidated Synopsis of Contract Award Information." Number 2 lists items being currently advertised for bids; Number 3 lists recent contract awards and is particularly useful as a prospect list for those interested in sub-contract work. This is a new service centralized in the Chicago office. Distribution is made nationally through more than 2000 Chambers of Commerce, Trade Associations and U. S. Employment Service offices.

4. Write to the General Services Administration, Office of Public Information & Reports, Washington 25, D. C., and ask to be placed on the mailing list to receive G.S.A. Reports. Under the G.S.A., the Bureau of Federal Supply operates as a central procurement bureau for all federal civilian agencies.

5. Write to the Economic Cooperation Association, Office of Small Business, Washington 25, D. C., for information on exporting procedure under ECA financing. Department of Commerce field offices will also assist in all phases of export activities.

6. Study the manuals. Determine where your present products fit into the picture. Call at the nearest office of all the procurement agencies who buy products similar to yours and find out quantities they buy and prices paid in previous awards. If your present product has no place make a study to find out what other products you can make with present facilities or with modest expansions.

7. Don't get discouraged. Doing business with the government is involved but not difficult after you learn your way around. Remember Uncle Sam is not ringing doorbells to buy, he must be sold, and sold according to the book so don't overlook the small type!

8. Investigate sub-contracting. This is doing work for government prime contractors. On the average, a prime contractor will sub-contract about 50 per cent of the job, and these sub-contractors will, in many cases, do the same thing.

9. Centralize responsibility. Handle all government work for both prime and sub-contract through one man or one department, with responsibility for all liaison, bidding, contracting, specifications, follow-up and study of the Government's rules, regulations and procedures. As with commercial work, the best policy is to play ball according to the customer's rules and give him what he wants, in the way he wants it. Because the rules are complicated, you need a specialist on your team.

Handling and Storage of Steel With Safety and Savings

All photos United States Steel Corp. Subsidiaries

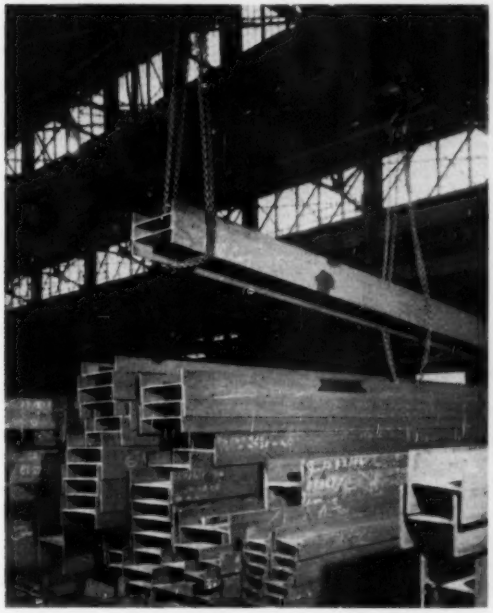
Right: A "lift" of steel sheets is lowered into place upon wooden skids at the Chicago warehouse of U. S. Steel Supply Co. "Lifts" vary in weight up to five tons. Cranes handle the heavier loads but the sheets are stored in piles so that movement of small quantities may easily be made by manual methods as well

Safety to both material and men is a necessary corollary to good steel storage and handling . . . At the same time, availability of the raw material is necessary to prevent slowdowns in production . . . This is the first of a two-part picture story on handling and storage of steel by leading warehouses of United States Steel Corporation . . . They have learned through expensive trial and error methods how to do the job safely

Safety in the handling of steel beams is demonstrated in this series of four photos. A workman in the Chicago warehouse of U. S. Steel Supply Co. shows the importance of always standing in front of the beams. First operation is

insertion of the hook securely beneath the lift. The end of the beams are then raised by the crane operator so that a chain may be placed under the beams. The helper guides a second chain under the beams as the first chain is moved

A vexing problem with many manufacturers is the efficient and economical storage of plate in an upright position. Many times the uprights are knocked over when swinging plates strike the uprights. This photo shows plate pockets used in storing plates running from 3/16 in. to 1 in. Plates are stored vertically using either a plate lifting magnet or plate clamps. Uprights comprise 6 in. H beams and are coped and welded into 8 in. H beams forming the base. Tops of uprights comprise plates which are 6 in. by ½ in. shaped into a cone form and welded with angular braces to uprights



by the crane operator to a central position. When both chains are in place the operator can alternately move them to a desired position near the center of the beams; safe movement can then be accomplished without danger to the

helper. Prior to the adoption of this practice the helper frequently stood at the side of the beams in order to place his chain and was in danger of being crushed if the pile of beams tipped over in his direction without giving warning

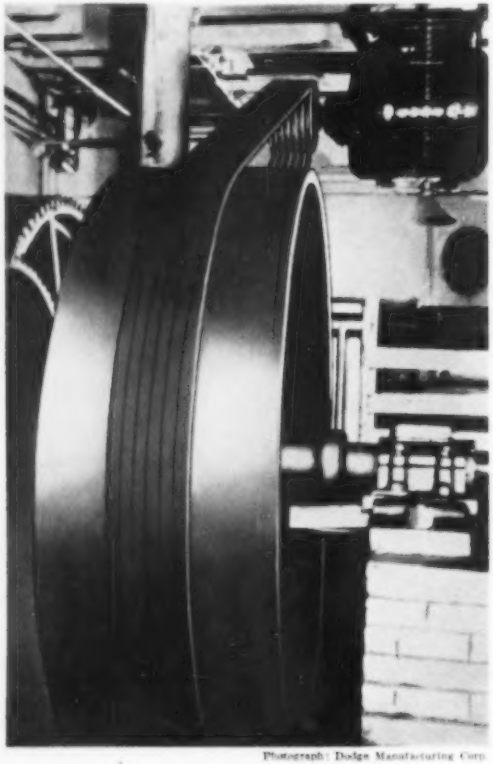
How Good Analysis Saves Power Transmission Dollars

Should it be a gearmotor, a speed reducer, sheaves with V-belts? . . . Do we need unit drives or group drives? . . . What's the process; what's the cost, what's the floor space? . . . Does it save on first cost and waste on maintenance? . . . Studies made by the author uncovered the fact that things are not always what they seem; it takes detailed investigation and analysis to get the truth—and lack of truth hurts

By WM. J. O'CONNELL, Process Engineer

MECHANICAL power transmission principles in industrial applications are constantly changing. It requires an active awareness on the part of the plant engineer to keep himself up to date on new developments and improved practices. Fortunately, this is not difficult to do. Technical publications are constantly describing new products. Manufacturers and sales representatives are not the least hesitant to talk about them, and their uses. An up-to-date catalog file is invaluable for reference.

However, if the plant engineer, or the person in the plant to whom power transmission application duties are delegated is not completely familiar with his own requirements, all the awareness in the world is of little use. A thorough, periodic survey from a power transmission standpoint will provide the final requirement for the well-rounded knowledge necessary to make the best use of the new developments and innovations.



Photograph: Dodge Manufacturing Corp.

Fig. 1. Through the use of V-flat belting this flat-belt driven flywheel was converted from a long-center drive without the expense of purchasing a sheave-type flywheel. At the same time floor space saving was made possible by moving the motor from the floor to a ceiling mounting

As an illustration of what can be done if an investigation is made, a survey made by the author can serve as a guide for those interested in improving their own power transmission applications. One must remember, however, that in discussing mechanical power transmission, characteristic or specific examples of savings possible through revising or changing a particular installation may serve as a pattern for methods and procedures, but these examples cannot be used as blueprints.

Every piece of equipment has its particular job to do, and although there may be more than one best way of doing that job, the type of installation used for a specific application in one plant is often not usable even for a similar application in another.

For practically any piece of driven equipment, mechanical power transmission is not a single item, but a combination of many. It does not involve just a motor, or a sheave, or a belt; but everything needed to most efficiently power the equipment. Motors, sheaves, belting, sprockets, reducers, couplings, clutches, chains, may be selected individually but each must also be selected with regard to the manner in which they will function with all the other parts.

The plant surveyed is a production shop, with production of two types; 1—fabrication and assembly on a mass production basis, and 2—single or multi-operation jobbing. Prior to the survey a number of manufacturers' and mill supply catalogs were thoroughly perused so that the mechanical power transmission situation would be fresh in my mind.

The results of the survey fell into nine categories, and each of these categories contains examples of applications changed or improved. They are as follows: a. Group Drives; b. Short Center Drives; c. Sheaves; d. Fluid Couplings; e. Speed Reducers; f. Tapered Bushing Inserts; g. Tension Controlling Motor Bases; h. Motor Windings.

This grouping into categories is, however, misleading in that each one may and does incorporate within it other items. This particular grouping was made arbitrarily with the category the writer considers the most important one as the title. Such obvious items as correct selection of motors, belting, bearings, etc., are not covered here. They entail principles well known, although some violations of these principles were also uncovered and corrected. What will be discussed are the not quite so noticeable details that are sometimes overlooked, or possibly not apparent, until the set-up is installed and operating.

In the modern industrial plant, the trend is away from group, and directed toward short center unit drives. Sometimes, however, a reversal of this process will provide a more economical and satisfactory installation. This became apparent in the portion of the survey that was concerned with the problem of whether or not to discard an existing group drive installation.

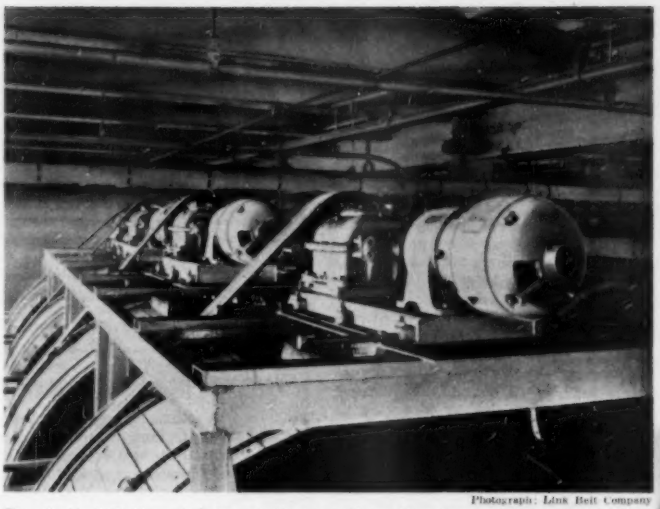
During the last war, when equipment of any sort was hard to obtain, it became necessary to fabricate a new, single operation piece in large numbers. Delivery of small presses of the type necessary for the operation was prohibitively in the future.

Therefore, several used machinery dealers were contacted and from several sources a sufficient number of the required type of presses were rounded up. Unfortunately, about fifty per cent of these did not have motors, but so urgent was the need they were also purchased.

When a search for additional motors proved ineffective, the line of thought shifted to group drives, several large horsepower motors being available. The presses were arranged into groups, and driven in accordance with accepted standard practice.

When supplies became plentiful again, there was a movement to replace the group drives with a short center unit type. In line with established practice to investigate thoroughly before making a change, this item was included in the survey.

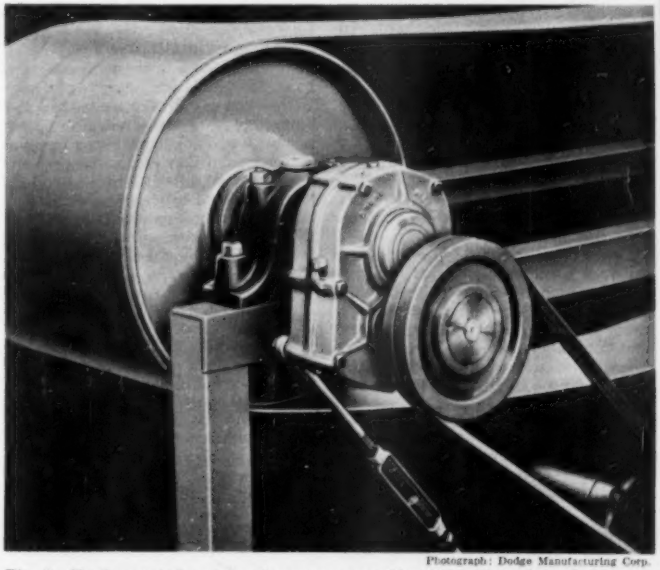
The presses in the group were still producing to capacity a peacetime equivalent of the wartime part that had necessitated the installation, so there was no change in requirements. A comparison of the operating characteristics was made with similar short center unit driven presses. The comparison showed that the emergency installation had definite advantages over the unit drives in this particular case. The following facts were brought to light: 1. There was a power saving because of the higher efficiency of the larger motors. 2. A better power factor was obtained. 3. With a stand-by press in each group, used only when one of the others were down, the connected load was lower. 4. Over-all maintenance requirements proved to be less.



Photograph: Link Belt Company

Fig. 2. Installation of fluid couplings on these drum-type mixers was the best solution to a tough problem in overload. Now the motors attain approximately 70 per cent of their rated speed before the drums start to rotate. Shear pins would have done no good on this job because of too-high starting torque

Because of this investigation, two other group drives have since been installed, where it was shown that they were applicable to the production. The following are prerequisites to the installation of the group drive in this particular plant: 1. High production runs of one or several piece parts requiring a battery of similar presses or machines. 2.



Photograph: Dodge Manufacturing Corp.

Fig. 3. Shaft-mounted speed reducers are exceptionally useful where floor space is at a premium. Lack of reduction variation is offset by the opportunity to use various size sheaves on both the driver and driven units. Also visible is a type of tapered bushing insert which facilitates removal of sheave when necessary

Available floor or overhead space for the installation of drive and countershaft.

Short Center Drives

A battery of older machines was inadequate to handle an increased production schedule so, in an area already congested, additional equipment had to be installed. The investigation was made to determine the least expensive way to consummate a layout rearrangement.

The old machines were long center flat belt drives, with a high reduction between the small driven pulley, and the large flywheel-driven pulley. This equipment was originally mounted long center to provide the necessary arc of contact between the belt and the pulleys. Because of the cost of new driven sheaves if the equipment were revised for short center V-belt drives, it was hoped to meet the problem another way, if possible. The situation was resolved by the use of V-flat belting, as shown by Fig. 1. By utilizing this and installing multiple groove drive sheaves it was possible to effect overhead mounting of the motors, appreciably decrease the shaft-to-shaft spacing, and at the same time make no change in the driven pulleys.

Sheaves and Sprockets

Because of the wide use of V-belting in the plant surveyed, and the different types of sheaves available for specialized applications, this item proved to be a major one. For the purposes of this article, it can be divided into two sections:

1. Sprocket with breaking pin: A metal powder mixer was able to handle a load of 10,000 lb limited by the horsepower of the motor and by processing specifications. It was started in operation empty, and loaded from one end while it was rotating. Occasionally an enterprising operator would attempt to mix as much as 50 per cent more than he should and several times this meant replacing the motor. To prevent this condition, the chain drive sprocket was replaced by another of the same diameter incorporating a breaking pin. By means of this breaking or shear pin the powder mixer was regulated so that a 10 per cent overload caused the pin to break. The pins were pre-necked at the factory to fracture at this overload.

It is considered better practice to install the breaking pin hub on the driven sprocket but because this was bolted to the side of the mixer the pin was put on the drive sprocket. Since the installation of the breaking pin hub there have been no cases of overloading and no burned out motors.

2. Adjustable diameter sheaves: This type of sheave is used extensively on equipment where the speed of the operation may vary but still does not require the flexibility available with the more expensive variable speed drive. As a result of the survey, the adjustable diameter sheave was adapted to two applications. The first instance involved a number of air conditioning units used in the various floors of the office building. In the winter the amount of air to be circulated was considerably less than in summer. This made it necessary to change blower sheaves twice a year. At several points this was difficult because of shaft location. In addition, space had to be provided to store the unused sheaves. Since the sheave itself was readily accessible in all the locations, a change was made to the adjustable diameter type. Now, when it is necessary to change the fan speed, it takes but a few minutes to adjust the sheave and the motor take-up adjusts itself.

The second application of this type sheave occured in an installation made for a manufacturer of a new product. A progressive setup was required with a number of V-belt drives. The actual drive

Variable Pitch Sheaves Show Versatility in Cooling, Heating

USE OF VARIABLE pitch sheaves on fans and electric motor shafts for combination direct-fired warm air heating and air conditioning or ventilating systems has proved effective.

The idea of variable pitch sheaves in this application is to vary the volume of air handled by the blower for seasonal requirements, either heating, ventilating or air conditioning. Usually, the blower and motor are located outside of the heater casing because of the extra-large size fan used. However, the principle also can be adapted for use in standard direct-fired heaters under certain conditions.

Such systems are highly flexible in their functions. The variable pitch sheaves can be installed for automatic as well as manual control.

In one installation for a retail store, an oil-fired heater with a capacity of 1,500,000 Btu per hour was used. The 20 hp motor and the blower have variable pitch sheaves, each with eight grooves for belts. During the winter, the blower supplies 17,000 cu ft of air per minute to the heater.

For summer operation, in conjunction with air conditioning, the pitch of the sheaves is adjusted by lever to increase the blower capacity to 22,000 cu ft of cooling coil-conditioned air per minute. For better efficiency, a by-pass duct carries 5000 cu ft of air from the blower directly to the main supply duct while the balance of the air passes through the heater unit.

Another advantage of variable pitch sheaves, it is explained, stems from their wide range of blower speeds which balance static pressures and velocities in the ductwork system.

Motors used in this application are mounted on automatic motion control bases that maintain uniform belt tension throughout the sheave adjustment range. A hand wheel on this base regulates the pitch diameter of the sheave while in motion while simultaneously moving the motor forward or backward to compensate for the change in centers between shafts.

Photo: Drave Corporation

Typical installation of variable pitch sheaves on blower and 20-horsepower motor used in a combination warm air heating and air conditioning system in a store

ratios could not be determined until production was under way so approximations were made and adjustable sheaves installed on the driven ends. When the proper ratios were determined the sheaves were so adjusted. In this instance a great deal of time was saved by eliminating experimentation.

Fluid Couplings

On another type of mixer the load was injected before the mixing cycle began. Overloading was also prevalent here but, regardless of load, the starting torque on the motor was exceedingly high. At intervals, because of this high starting torque aggravated by periodic overloading the motor would fail. A sheave with a breaking pin was useless because the starting torque was higher than any possible overload. To remedy both conditions a fluid coupling was installed between the motor and the drive sprocket as shown by Fig. 2. By the use of this coupling the motor attained approximately 70 per cent of its rated speed before the mixer started to turn, and with too great a load it would not turn at all.

Shaft Mounted Speed Reducer

Gearmotors are not an economical type of drive when motors of the correct horsepower are available. In the plant under discussion it became necessary to increase the number of production machines in an already crowded area. The motors were rated at 15 hp, 1200 rpm. Each was direct connected to a reducer which was in turn direct connected to the machine drive shaft. Press frame construction was such that floor mounting of the motors was necessary.

The first thought was to equip all the machines with gearhead motors, but the expense involved prompted an investigation to see if anything else could be done, using available motors, and still obtain the necessary floor space. The result was to use a type of reducer, shown in Fig. 3, that mounted directly upon the drive shaft of the equipment, short center, V-belt driven. Although reduction ratios of the reducer were limited, it was possible to select the right sheaves to provide the required speed. This satisfactory result was obtained at a fraction of the cost of gearhead motors.

Tapered Bushing Inserts

These inserts are becoming increasingly available in pulleys, sheaves, sprockets, couplings, flywheels, and impellers. They also may be purchased separately, and the part in which the tapered insert is intended to be used may be machined to fit the bushing. The most common type consists of a tapered, split bushing in a tapered hub. By taking up on three screws, the bushing is drawn tight over the shaft upon which it is placed.

In the course of the survey, the versatility and flexibility of the item became apparent and numerous recommendations were made for its use. If necessary to change a sprocket or pulley from one shaft to another, of a different diameter, all that is necessary to change is the bushing, and two similar items of different bores need not be stocked. By stocking a number of bushings with various taper and shaft bores, the reuse of shaft mounted items has greatly increased. It is intended to equip all feasible items with the tapered inserts. Another advantage has been the ease in installing the part upon the shaft, which has meant a lowering in repair time. A third advantage, which has proven its worth upon occasion is the ability to mount the tapered installation closer than the conventional type.

Tension Controlling Motor Bases

In a battery of multiple V-belt driven bucket conveyors handling materials of various densities, some showed a much poorer belt life than others. In the course of the survey, it was found that those with the poorer belt life handled a variety of materials, those with normal life handled a uniform product. The conveyors handling the various-density materials produced a greater belt stretch, and the little take-up available from the motor bases could not compensate for it, thereby permitting excessive slip and wear. Spring type take-ups were installed. These automatically adjusted themselves to eliminate slip and hold a constant tension. With this change, when the stretch was at its maximum no slip occurred and the belt life subsequently increased.

The motors previously mentioned as being used on air conditioning systems were also equipped with tension controlling motor bases. In these locations, in close proximity to steam coils, wide temperature variations were prevalent, causing expansion or contraction of the belts. By installing pivoted motor bases, a constant belt tension was maintained.

Maintenance Faults Uncovered

While conducting the survey it was discovered that no record was kept of motor life. When a motor breakdown occurred, there was no way of knowing whether it was the first, or one of many. A system was established, therefore, to give a visual indication of motor overhauls. This was done by coloring the insulation varnish, and changing the color to be applied every six months. In this way, the life of the motor and the period since the previous breakdown is readily apparent.

In addition to this, ordinary maintenance problems were uncovered. Excessive belting wear was found due to misalignment of sheaves. Through realignment and by installing a system of periodic inspection these faults were corrected.

Some flat belting was very dusty, producing excessive slip. A listing of all flat belting in the plant was made, this list to be subject to periodic inspection and belt maintenance procedure.

Some wartime installations were driven by motors of excessive horsepower. Where proper-size motors were available a change was made. Otherwise, the installations were not touched, but a record was made of the installation, the motor horsepower installed, and the correct horsepower. Now, when a motor of the correct horsepower is available, or when the installed motor can be used for another installation, a change will be made.

Such items as lubrication and bearing maintenance were found to be adequately handled.

To complement the survey, however, a complete maintenance procedure for the inspection of power transmission items was written. With the exception of checking motor loading, which is handled by the electricians, two millwrights were detailed to keep a running check on all transmission items from a maintenance standpoint. This check, although not systematized, is handled so that all items are inspected at least once a month.

Inspection Card System

A numbered inspection card was attached to each transmission item, with the date of inspection noted. The card serial number corresponds with one in a notebook issued to the millwrights. Listed in the notebook is the bay location and inspection date. In this way the millwright knows which items require inspection. As preventive maintenance, this inspection has decreased normal maintenance requirements, and cut replacement by 30 per cent on mechanical power transmission items.

As stated previously, this article does not pretend to state all transmission problems, nor to solve them, but it is intended to show the way. The actual problems are as varied as the number of plants in this country. However, if the plant engineer realizes that the problem is present, the situation is partially resolved. New items are being developed and placed on the market; improvements are being made on existing products constantly; installed equipment is wearing out. By keeping up to date on new developments, and the maintenance situation of the present items in his plant, the over-all transmission budget will show a noticeable decrease. However, first re-acquaint yourself, and make a survey.

It Results in Better Operators, Lower Costs, Fewer Accidents

Teaching crane operators and maintenance men with a miniature crane may seem to be child's play but it has helped Armco reduce accidents, save ruined equipment and prevent loss of life and limb . . . Entire program results in selection of high grade personnel, trains them where little damage can be done, watches them through initial on-the-job period and builds their confidence and knowledge at proportionate rates

By **E. BARKER**
Armco Steel Corp., Middletown, Ohio

THE ADVANTAGES of visual and actual training on the job are well exemplified in the miniature crane used by our company to train crane operators and maintenance men. The supply of model cranes is very limited, and they are expensive. Several years ago, Armco Steel Corp. contracted with one of our engineers who is a model builder, to construct a model crane with our standard safety and operating features incorporated.

In our crane training program, we have two old-time crane operators who spend all of their time training crane operators. These two men have a total of 60 years service as crane operators.

Our procedure can be quickly outlined in this fashion:

Selection—All candidates are given IQ, Personality Inventory, and Mechanical Comprehension tests. If these interpreted values are too low, the candidate is given no further consideration as a crane operator.

Physical Examination—If his tests are satisfactory, he is sent to the Medical Department where his physical examination includes emphasis on the condition of eyes, heart, and hearing.

Interviews—Having been found to be an acceptable physical specimen, he is given an interview card which must be signed after interviews with the Safety Advisor and Superintendent of Maintenance.

Crane Trainers—The candidate is then under the wing of the crane trainers and he is paid a basic wage until he is deemed ready to operate a crane alone on an established job.

Tests—There is much factual material which is presented to this new man. He is told that he must pass written, oral, and actual operating tests before he is considered an operator. Since there is a wide variance in trainees, there is no time limit set for this training period. The average period is about four weeks.

The model crane is then demonstrated to the trainee.

The Use of the Idle Crane—After the candidate has absorbed some of the fundamentals about a crane, he is taken to an idle crane and shown the safety, operating, and maintenance features of the crane. He is shown how to operate the controls, and then he is permitted to operate this idle crane for a period of about 10 days. He finds that things look different from the crane cab. Have you ever taken your crane-leaders and hookers into the crane cab to observe? Try it.

Fig. 1. Trainees, when using a miniature crane, can observe every detail and all external factors without tension or divided interest. At right is crane control

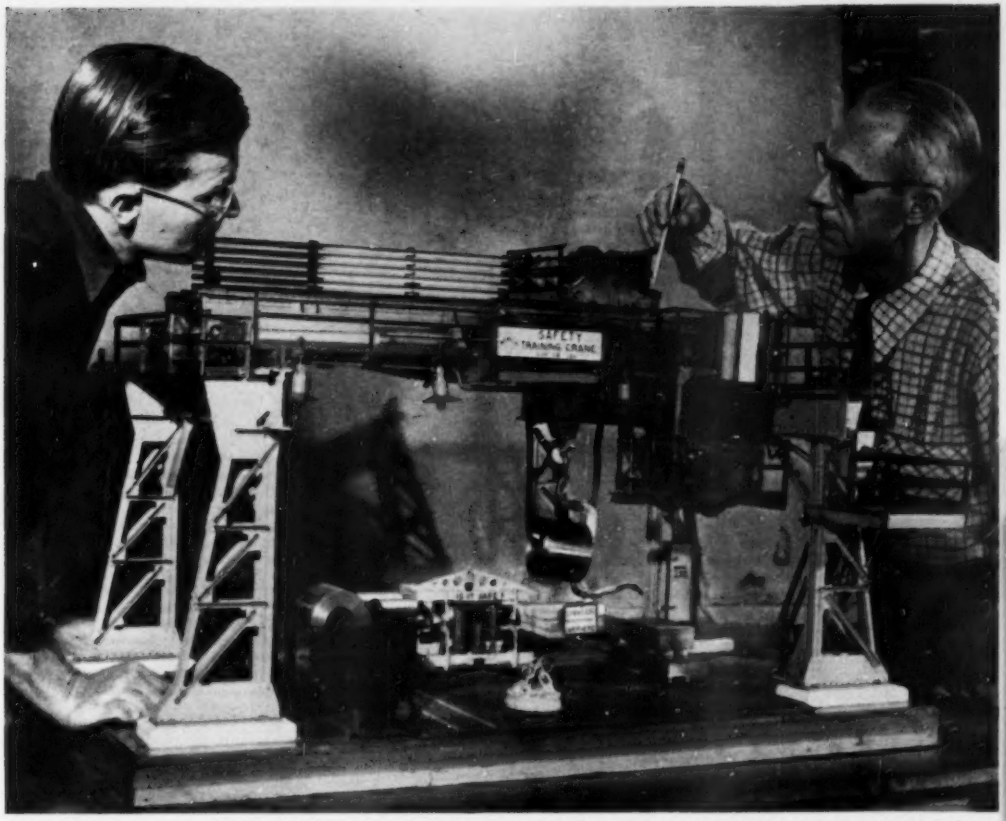


Fig. 2. Here one of the highly skilled instructors (there are two of them with a total of 60 years experience) explains details of operation and care of cranes to a trainee. Men are selected for training program only after rigorous examinations, for physical and mental fitness, and interviews with the Superintendent of Maintenance and Safety Advisor

The Model Crane—He is then returned to the model crane. He can look down on it, under it, at it—he can get any perspective he desires. He sees more closely the operation of the limit switch. The fire extinguisher is pointed out and he is cautioned in its use; next, the platform boards.

Then, the use of the main disconnect switches in the cab and on top of the crane are explained. What happens when a load is off center when picked up? The importance of proper signals is outlined and stressed.

Next, the use of the siren or bell is emphasized. Brake adjustment and checking. Why and how to lock out switches. Position of floor crew—hands— bodies. The inspections he must make at the start of each turn: (1) limit switch; (2) siren; (3) brakes; (4) fire extinguishers. Abuse of cables by pulling railroad cars. Controllers: which is which—how they work. Trolley control and how to take the swing out of the hook. Bridge control—hoist control—coordinated use of all controllers. Lubrication—how to maintain the crane—cleanliness. Crane rating system. Use of hand line—accept signals from only one man. Stop crane if lookout is not supplied when required. Avoid pushing or bumping other cranes. Use of "Men Working Overhead" signs.

Return to Full Size Crane—He is placed in the custody of a carefully chosen operator, and he observes this experienced operator for a number of days with the regular operator watching. He then makes a few lifts. This procedure is followed until he is thought to have the knowledge and the "feel" for the crane.

Result—The model crane is expensive, but so are parts of the human body. So are pieces of equipment which may be damaged or destroyed during the learning process. We believe that in these terms, our model crane is very inexpensive. We believe it has been a distinct aid in preventing injury to personnel, in preventing damage to equipment, and in molding a high class group of crane operators. He is taught to work in complete harmony with floor crews.

FREEDOM FROM lawn mowers is a future possibility that should bring cheer to many plant gardeners.

Scientists for the U. S. Rubber Co. have developed a new type of weed killer named maleic hydrazide that has a variety of remarkable properties. For one thing, it is efficient in killing off various grasses that are a pest to the farmer.

But beyond this it is what is called a growth inhibitor, which means that when properly used it will slow down growth without killing the plant.

Preliminary tests in New England show that the material when sprayed once on a blue grass lawn killed off intruding crab grass and also retarded the growth of the blue grass for six weeks without hurting it.

When tried on a fast growing pyracantha hedge in California, growth was slowed down so that only two cuttings a year were needed instead of two a month. A word of caution: lasting effects on lawn grass have not yet been charted. It is possible that many applications might kill these, too.

The "Flexible Plant"
Can Be Achieved Only by Planning

Location . . . One story vs. multi-story . . . To air condition or not to air condition . . . Receiving and shipping facilities . . . Providing for additional floors . . . Floor loading and floor surfacing . . . Ceiling heights . . . Crane locations, present and future . . . Sizing and locating utilities for future flexibility . . . Truck doors and railroad sidings . . . Universal conveyor systems, standardization of types and re-use value . . . Communication facilities . . . Partitions for offices, storage areas

By R. M. FRANCIS*, Plant Engineer

WHEN A NEW PLANT is under consideration, there is a job to be done by industrial plant design specialists. Some of the larger companies maintain their own staffs of industrial engineers and architects; some even have construction departments to handle all building projects and alteration work. Small companies cannot usually justify the expense of such departments, however, and often rely to some extent on outside experts to plan and develop their new construction or alterations. In either case, a vast amount of preliminary planning must be done prior to the launching of the actual building design project. The importance of this preliminary planning cannot be over-stressed, and the following paragraphs will illustrate some of the features to be considered in the planning of a new plant, if complete flexibility is desired.

The New Plant

Let us suppose that a brand new plant is to be built, and that the economics of the project justify the expenditure of any reasonable amount of money to get the best in building and facilities. This happy dream does not often materialize in the history of the average industrial plant, and we will not attempt to elaborate on each and every phase of such a project. Needless to say, countless volumes have been written on the whole general subject, and it is not the intention of the author to try condensing all these volumes into a few paragraphs. However, just to brief the subject, generally, let's take a look at what can be anticipated.

First, in real estate, we'd find a large tract of land in a suburban area. Why? Simply to furnish such desirable features as: 1. Ample parking space for employees; 2. Space for recreational facilities; 3. Lower taxes; 4. More desirable labor market; 5. Adequate space for outside storage; 6. Lower land cost; 7. Psychological advantages of natural surroundings; 8. Greater flexibility for transportation facilities; 9. Room for future expansion; 10. More desirable building construction codes.

Next, in the type of building, we'd probably see a one-story structure, unless the manufacturing process called for multiple floors. This building would be of brick and steel, reinforced concrete, or other permanent materials such as metal curtain walls requiring low maintenance expense. Windows might, or might not, be present. If they were a part of the design, they'd most likely be of glass-block, of metal sash and glass; or perhaps aluminum with plastic glazing. In large one-story plants, windows contribute very little to the utilitarian value of the structure, because artificial light is required throughout all production areas, and mechanical ventilation or air-conditioning is generally designed into the scheme of things. Just in case the question is asked as to why a one-story plant is fundamental, the answer is readily available in two words: "Materials-Handling." This term appears in every phase of industrial design thinking, and is of paramount importance.

Air conditioning study is a "must" in plant design considerations. The expression means only refrigeration to some people, but this is most certainly a misnomer. Some manufactured products require temperature and humidity control, which naturally call for refrigeration; but all manufacturing processes require some form of air conditioning; be it simply heating, or a combination of that together with ventilation, dust-control, etc. Industrial designers today will most likely advocate windowless, air conditioned buildings—and will come up with an excellent economic study to prove that their designs will be most economical in the long run. Regardless, don't overlook at least a careful consideration of complete air conditioning for your new plant, despite how ridiculous it may seem at first glance. Furthermore, it will pay to investigate the cost of planning for air conditioning to be installed at a later date. Space can be allotted for refrigeration equipment, water cooling, piping and duct work.

Now, assumming that the site has been selected, and the general type of building determined, what are some of the prime features which must be considered with regard to flexibility for the future? Here are a few basic ideas that should be incorporated into the design of the completely flexible plant.

1. Must the building be so designed that the receiving and shipping facilities are in fixed locations? Must production facilities always be set up so as to tie in with these areas in fixed locations? And, does the plant necessarily have to have railroad sidings in one location only—or probably two? The answer to all three questions is that, in a large number of cases, the decisions are made without considering the value of flexibility in the future; the common answer could very reasonably be "No." Consider the possibility of several railroad sidings—into the building—for the full length of the structure. Unused sections could be floored over with an ingenious ar-

*The author, for reasons of company policy, prefers to remain incognito for the time being. He is plant engineer of a large eastern manufacturing company and has had 23 years experience in plant layout, design, construction and maintenance. This, the first of several articles which will appear under the above nom de plume, is part of a book which will be published at a later date

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rangement of removable sections of flooring. At first glance, this might appear to be utterly ridiculous and too expensive to warrant serious consideration.

However, just ask any plant manager how many times in his experience he could have saved thousands of dollars a year had he been able to practicably relocate his receiving or shipping facilities. His answer would prove that the above suggestion is not as ludicrous as it might seem at first. After all, the safety valve on a boiler serves no useful purpose at any time except when you need it most. Again, the all-important item of Material-Handling expense control comes into the limelight; and any fixed facility in a plant, which causes excessive costs because of its location, is an item to be reckoned with forever. Add a few cents per trip, for a few trips per hour, for á few years, and the sum begins to approach the cost of a flexible receiving and shipping layout.

2. If a plant is to be built in a location where the building covers all of the land owned, do not overlook the possibility of a second—or even a third—floor on the structure at some later date. The incremental first cost, of heavier footing and columns, will be insignificant compared to the cost of increasing them at a later date.

3. Floors, of course, must be designed for any possible dead-loads that might be encountered in the particular plant being designed. To this must be added the live-load factor that will safely handle modern materials-handling equipment and methods. By way of explanation, it should be remembered that a fork truck, carrying a heavy palletized load, has an extremely high loading concentrated on small wheels, and this impact must be designed for. Also, the sizes and capacities of fork trucks are continually increasing. Floor design is for the structural engineer to worry about; however, the Plant Engineer must realize that the average floor of twenty years ago is of little value in most new plants of today's design.

Next, and of equal importance to floor design, is the matter of floor surfaces. This subject covers a very broad field in itself, but certain general considerations are worthy of note at this point. The portion of floors devoted to traffic aisles must receive plenty of study and consideration, if future maintenance expense is to be held to a minimum. After permanent locations of main aisles have been determined, the surfacing of these strips must have special design attention. Perfect traffic aisles must include these features: (a) correct width; (b) minimum number of turns and corners; (c) proper marking for edges; (d) very hard and very smooth surfaces; (e) no hazards or obstructions in—or above—the aisles; (f) no blind corners; (g) proper safety markings; and (h) proper radius on turns.

Photo: Nelson Stud Welding Div.

Fig. 1. Column spacing is important to future flexibility of the plant. The 20 ft of the plant of yesterday has today stretched into distances of 30, 40 or more ft

Regarding floor surfaces in general, it can be stated that very few parts of an industrial building have the same effect upon the economics of operation as the floors. Improper selection of floor surfaces can be seriously expensive in cleaning cost, poor light reflection, employee fatigue, destruction of rolling stock, and high maintenance costs. Some companies once standardized on wood-block floors for all areas other than offices; others used hardwood floors; some preferred concrete.

No particular floor surface is applicable to all areas of a well-designed plant. Probably one of the most logical floors to consider for general areas is the type which employs a hard, oil-proof mastic tile, laid directly on concrete. The advantages are manifold; the main disadvantage is first cost, only. Very few industrial operations would not rest very nicely on such a floor; some exceptions being those which involve high heat, acids or alkalies, etc. Always bear in mind, however, that flexibility of layout in a plant can only be attained through the use of floors which are suitable to many types of operations. In other words, look to the future, and ask one question: "Will this floor be suitable for almost any operation that might be placed on it in the future?"

4. As floor space is valuable, the cubeage of any building must be utilized to the fullest extent; materials must be stacked up so as to conserve this floor area. Modern palletizing and stacking techniques prescribe high ceilings. Some years ago, a 15-ft. ceiling was excellent; today, that figure has trippled. Many a plant could save thousands of dollars annually if an additional 5 or 6 ft. of headroom could be added at least in the warehouse areas. Again, think in terms of flexibility for the future. What is an assembly area today might be a warehouse tomorrow; then headroom really becomes important. And, in designing for proper ceiling height, see that this valuable space is not cluttered up with unnecessary piping or other equipment.

5. Column spacing, too is important to future flexibility; a 20-ft. spacing of some years ago has stretched into 40, 50, 60, or more, ft. today. Naturally, construction costs go up as column-spacing increases, but there is one optimum size of bay that will provide for the present, and also give flexibility for the future.

6. If the plant will manufacture heavy equipment, and overhead cranes are required, consideration should be given to the need for more than one crane location in the future. If there is even a remote possibility that such might be the case, the original columns should be so designed as to provide for installation of crane rails at a later date.

7. One of the most serious mistakes made in new plant design is that of sizing, or locating, the various utilities only for the present requirements. Very excellent "flexibility-insurance" can be secured, without too great a cost, by providing carefully designed electrical and piping systems. For instance, it is standard practice with some companies to install a regular pattern of power and lighting ducts over the entire plant. Such ducts provide al-

Photo: The Bellanca Electric and Engineering Co.

Fig. 2. Communication facilities are a necessary part of the modern industrial plant. Several types, from television to pneumatic tube systems like the one pictured here, play proper roles depending on needs and money available

most immediate sources of electricity for lighting fixtures, and for most power applications. Of course, large power loads must be handled as separate circuits, but the average machine can be relocated and reconnected with ease, and little expense. Cable raceways should always include several spare ducts for future cable installations.

8. The primary purpose of any plant, of course, is to produce a product. Keep in mind the fact that products change in design and process; new types of products are made and the ever-increasing probability of war makes likely the introduction of radically different types of materials and finished goods. Often such vastly different procedures and methods can not be forecast but plants which had experience in the last war will have a slight amount of historical data for guidance.

All piped utilities can be made highly flexible in their applications, if careful study is applied to the original design. Among the various piped facilities which have successfully and economically been conveyed thru a network pattern of piping in a plant are these: Steam, water, air, oil, cutting oil, various process gases, etc. Also, in woodworking, milling, and similar plants, a manifold duct system, for dust collection, should be considered.

Drainage systems should be flexible, too. At least, sufficient floor trenches—of the proper size—should be provided. Then, when the time comes for the alteration of a drainage system it will not be necessary to tear up the entire plant floor to accomplish the objective.

9. Of course the ideal production floor would be one that was not cluttered up with anything which was not a functional adjunct to production equipment. This, however, is not entirely possible, but can be used as a target for design engineers to shoot at. For instance, most service facilities can be located either below, or above, the production floor. Certain of the modern war plants had all toilets, washrooms, cafeterias, substations, janitor closets, placed in basements under the main floor. Even the older plants have placed some of these services on mezzanines or in basements, in the past. However, in a strictly modern plant, all services of this type should be off the production floor.

10. Truck docks, to be most desirable, should be under roof, well lighted and drained, and should be equipped with leveling devices to make any truck bed match up with the dock height. Docks should be so designed that trucks are in a level position at the docks. Inclined ramps are definitely hazardous and should be avoided in all cases.

11. If the plant is to be used for assembly operations, or warehousing, thought must be given to some type of universal conveyor system. This might be either of the floor-type or the standard overhead design, with suitable modification for the product to be manufactured, or handled. Again, it should be stressed that even this equipment must be designed for flexibility, to be most economical over a period of years. It is not necessary to have a maze of conveyors linking every foot of space in the plant; however, it is well to consider all possibilities in the future, and provide for them. At least, standardize on the types, to best serve the plant; pick equipment that can be salvaged and reinstalled at low cost; etc. And, if floor-type conveyor is to be used, at least provide the floor channels in locations most generally indicated for it.

12. Communications facilities in a plant might consist of any combination of the following systems: (a) telephones and other utility-company equipment; (b) public-address systems; (c) intercommunicating units; (d) pneumatic-tubes; (e) two-way radio; (f) direct mail dispatch; (g) television; (h) paging systems; and (i) special systems. Each has its particular advantages and disadvantages, and most companies find it necessary to use several of them to most successfully conduct their operations.

Telephones, of course, have served a general usefulness in plant operations for many years; however, the telephone companies can offer numerous extraordinary features in their service which contribute greatly to the smooth operation of industry. "Teletype" and "Facsimile" types of equipment are some of these. Also, special hook-ups and devices contribute to the general effectiveness of telephone systems.

Public-address systems provide the means for local, or general, paging, general announcements, broadcast of entertainment, panic-control in emergencies. A well-designed system will provide full coverage, and will be flexible enough to accommodate future plant expansion.

For localized communication between fixed points, the "Intercom" sets offer private, or non-private, speech transmission. These units are a valuable tool to the supervisory personnel of any plant; and are great time, and step, savers in certain production areas.

Message Transmittal

In addition to voice transmission, it is often necessary to send papers, packages, or small articles, from one point to another, in a short time cycle. Pneumatic tube systems were developed for this purpose years ago; and even today, they offer many possibilities to the engineer with vision and ingenuity in application.

Plants which occupy large areas, and in which it is necessary to maintain contact with traveling equipment or personnel, have a definite use for two-way mobile radio sets.

And, of course, the basic system of direct mail dispatch can be set up in a modern, highly efficient system if enough study is given to it. If warranted, special conveyors, chutes or dumb-waiters can be designed and installed to provide a highly mechanized mail-distribution system.

Commercial television apparatus offers an unlimited field of new ideas in flexible plant communications. Relaying of vital plant operating data can be instantaneous between points in a plant. For instance, the remote visual "scanning" of instruments or equipment can result in tremendous savings in time and dollars. In this application, it is only necessary to let one's imagination "run loose" to see the unlimited possibilities.

For relatively inexpensive paging systems, the coded-bell-signal system is an old standby. Some plants have used this system, with either bells or lights, for many years. Of course, this equipment offers only a few of the advantages of a complete public-address system, but the cost is much less.

Finally, in the industrial plant communications category is the class of special equipment to fit a particular application. Selsyn-motor circuits offer definite advantages in operations where the information to be transmitted is limited. Power plants, for instance, utilize this system quite extensively to transmit limited instructions from boiler-room to turbine room. Even the most simple sort of electrical or mechanical application of a device for intercommunicating between points has some possibilities, and should be explored.

Movable Partitions

13. A certain footage of walls and partitions will be required in any plant, to furnish security, privacy, soundproofing and safety. Each of these cases must be carefully considered with a view to the future. A number of excellent movable partitions have been on the market for years. They can be attractive, are well-designed, and will enhance any plant's appearance. Although the first cost is higher, generally, than some types of stationary partitions, this difference will be more than offset by the savings made.

Wire-mesh warehouse panel partitions make very excellent "fences" with which to protect warehouse stocks. They are relatively inexpensive, and permit good ventilation. Being open, complete visibility is assured. This, in addition to other advantages, encourages good housekeeping, which is all-important to good operation.

Fire towers, store rooms for flammable materials, and other fireproof enclosures are generally required to be constructed of fairly heavy, permanent, masonry construction. This being true, care should be used in selecting their locations, so as to best avoid inflexibility in the future.

Most companies which use soundproof test rooms, or "screened" cages for electrical test purposes, have developed designs for prefabricated, demountable, units which are easily relocated. These designs have been the result of development work necessitated by frequent relocations. All of which emphasizes the great need for "flexibility-design."

Of general importance is the matter of designing buildings to take advantage of any favorable weather conditions. A few years ago, certain power-plant designers broke away from the traditional power house structure design, and laid out complete power plants open to the weather. It is perfectly reasonable to assume that a lot of plant equipment need not be under roof; in fact, certain types of it will function better when exposed to the weather. Also, in warm southern climates, full advantage is being taken of the weather, by certain designers of industrial plants. (A recently-constructed food processing plant was built without any walls whatever. This is a highly-important safety feature, too).

All plant utility equipment should be standardized and be readily movable, insofar as possible. Even warehouse shelving can be constructed of unit-type steel members and fittings, which makes it universal in adaptation. All parts are 100 per cent salvageable, and any combination of sizes is obtainable through its use.

In tackling each phase of plant design, layout, and equipment selection, carefully study each item to ascertain whether it fills only the present requirements, or will be adequate for future needs and future expansion. Don't be satisfied to accept something which is "good-enough," or which is the cheapest at the moment. First cost is only one consideration in this field. Added features which contribute to flexibility for the future will prove to justify their first cost, many times over.

A few questions to use as a guide in building, and equipping, your new plant, are these:

1. What items are to be in permanent locations?
2. Can the equipment be relocated quickly and inexpensively?
3. Does it lend itself to expansion?
4. Will it be obsolete in a few years?
5. Is it flexible in its application?

Use vision and ingenuity in the selection of each and every building detail, and the equipment that goes into the building.

Photo: The Reliance Electric and Engineering Co.

Fig. 3. Storage areas must have plenty of ceiling height and wide, uncluttered aisles

New Induction Heating Technique

A NEW TECHNIQUE for the induction heat-treating of nonferrous metal strip such as aluminum, brass, copper, magnesium and stainless steel—called "Transverse Flux Induction Heating"—was recently revealed by R. M. Baker, Westinghouse Electric Corp., Baltimore, Md.

Mr. Baker declared that transverse flux induction heating is the only practical and economical method for the continuous induction heat-treatment of nonferrous strip. "Conventional radio-frequency induction heating, so admirably suited to the heating of magnetic steel strip, is not suitable for heating nonmagnetic strip," he continued, "because of low power factor and inefficiency, and because the small cross section of the nonmagnetic strip intercepts only a very small percentage of the flux through the inducing coil. The transverse flux method overcomes this difficulty, since magnetic flux is directed perpendicular to the surface and through the strip—instead of along its length, as in conventional radio-frequency induction heating."

Transverse flux induction heating is accomplished by passing strip between two opposing laminated pole structures. The field coils, supplied with alternating current, are oppositely polarized so that flux is forced through the strip. Frequencies of from 60 to 10,000 cycles per second are used with this system, depending on the thickness of the strip and its resistivity.

Mr. Baker pointed out that two experimental 300-kw pilot line installations have been made. Transverse flux induction heating, although still in the experimental stage is proving itself very effective.

HOW TO BUILD PROTECTION INTO BUS DUCT SYSTEMS

Part I*. Bus duct advantages and types . . . Electrical characteristics as contrasted to conventional conductors . . . Protective device requirements and overcurrent functioning . . . Overload protection to gain full benefit of bus duct capacity . . . Short circuits . . . Importance of adequate interrupting capacity . . . Effect of power arcs . . . Why both minimum and maximum short circuit values must be considered

By J. T. EVANS, Planning Engineer, BullDog Electric Products Co.

BUS DUCT, as an electrical distribution system, offers distinct advantages. This point is amply demonstrated by its ready acceptance and widespread use in industry. From a production viewpoint, bus duct permits virtually unlimited freedom in the relocation of machinery and equipment, a feature which enables plant and production engineers to draw an occasional deep breath in spite of hurried and hurrying changeovers.

Physical differences between bus duct and other distribution arrangements are quite evident. Unfortunately, the electrical differences are less widely appreciated. This is particularly true of the auxiliary protective devices. Full appreciation of their proper use and application goes a long way in determining the degree of satisfaction which a bus duct system will give.

In many installations, protection for bus duct is selected on the same basis used for conventional set-ups. Results may appear to be reasonably satisfactory. In a majority of cases, however, the installed duct is neither receiving the best protection possible nor is it being utilized to its full inherent advantage.

It is true that many of the same rules apply to the protection of bus duct systems as to other conductor types. In order to assure maximum system flexibility and performance, however, certain exclusive properties and characteristics must be properly evaluated by the system designer.

It is our purpose here to: 1, examine the properties devices must have to function properly, thereby insuring full value from the bus duct system while adequately protecting against overload and short circuits, the two types of overcurrents; and, 2, survey currently available protective devices in the light of these requirements.

In low voltage distribution systems, a practical definition of electrical protection for any given set of conductors might be: "The systematic placement of proper circuit-rupturing devices in the conducting system to prevent destruction of a portion, or portions, of the system in the event of harmful overcurrents."

This article, like the definition, deals with protection of the conductors themselves. More narrowly, it is devoted solely to bus duct, an electrical distribution system for which such specialized information does not exist in available, complete and collected form.

It should be made clear from the outset that at no time in this discussion are protective units in branch tap-off devices (bus plugs) included in the general term "protective devices." Although naturally associated with bus duct, bus plugs are not primarily designed to protect the duct itself and must only meet requirements for the branch tap-offs. Bus plugs are mentioned only because their plug-in contacts must be considered a functional, if not an intrinsic, part of the duct. As such they, as well as the inclosed bus bars, must be protected.

Functioning On Overcurrents

"Function" should not necessarily suggest that service be interrupted by the device. Paradoxically, the first requisite of a protective device is that it *not* interrupt service, at least not until the point when damage would result if the circuit remained closed. "Function" implies that the device be increasingly ready to act as the need mounts, and is a correlative of overcurrent time and magnitude.

Obviously, the device must operate safely and without damage to itself or associated equipment when called upon to do so. In addition to functioning to either hold or interrupt service, as dictated by conditions, the protective device ordinarily serves as a disconnecting means. This is important, as it permits isolation of the affected area for remedial work while other areas remain energized.

Location of protective devices actually determines the pattern of the bus duct system, and in so doing enhances or detracts from its flexibility. Occasionally it is still unavoidable for devices to be groped in a switchboard from which all duct runs emanate. A more logical pattern and one which gives full play to the duct's potential flexibility, is a "grid," with plug-in runs branching through protective devices from low impedance feeders as shown by Fig. 1.

Most systems are, of necessity, a compromise between the extremes. The pure "grid," while not always feasible because of peculiarities in loading or in building features, extracts maximum utility from the duct. It is the culmination of the evolution from traditional centralized electrical systems to the freer decentralized type.

Overload

An overload is current flow above rated circuit capicity arising from circumstances within the circuit itself. On a circuit supplying a single motor, for example, this might be a stalled rotor condition. If allowed to continue, damage could result to the conductor as well as to the motor windings.

This condition is not of particular concern to bus duct. Except in special applications, bus duct serves a number of loads of varying magnitudes and duty cycles. Even when more machines than normally anticipated are operating at the same time or when several are started simultaneously, no hazard is present.

That the duct may actually be carrying considerably more current than its rating for a short period of time does not call for operation of the protective device.

* This is the initial section of an article covering, for the first time, comprehensive application experience with proper bus duct protective devices and the contrasting requirements of these devices when used with bus duct and other types of electrical conductors. Part II will discuss characteristics of fuses and Part III different types of circuit breakers.

To a certain extent, this is true for all feeders. However, there is danger that physical insulation of conventional conductors may be destroyed or severely damaged from heat generated by this excess current, especially by repeated subjections. With bus duct, which employs air as the main dielectric medium and has little or no physical insulation, the effect of the overload is simply a higher temperature rise of the copper bars and the surrounding air.

The fact that bus duct will perform satisfactorily at well above today's standards is attested by the elevated ratings assigned to it during the war. At that time, critical shortage of copper gave rise to temporary classifications as much as 40 per cent higher than pre-war ratings for the same physical sizes.

While the duct apparently was not adversely affected by this, continual service above presently-assigned ratings is not recommended from the standpoint of electrical efficiency. Underwriters' Laboratories now base rated capacities on a maximum permissible temperature rise of 55 C. above ambient of 30 C.

War-time standards do, nonetheless, point up the benefits of bus duct's virtually non-deteriorating materials. They also illustrate that duct can be exposed, even continuously, to temperatures of 70 C. above ambient (wartime standard) without detriment.

There obviously need be no hesitation in permitting short time overloads on bus duct. Consequently, the protective device can have a long time delay on its overload characteristic so that circuits will not be unnecessarily isolated under such circumstances. To gain full benefit from, 1, bus duct's normal loading characteristics and, 2, its absence of vulnerable insulation, *select protective devices with long-time delay.*

The device with even the longest time delay can be selected without mental reservation. The time required for bus duct to reach its maximum permissible operating temperature (55 C. over ambient) under *any* current value is *much* longer than the time taken for any presently available protective device to open under the same conditions.

As an instance, approximately 300 sec. elapse before temperature of a bus bar carrying five times rated load will rise 55 C. Under the same loading a Fusetron, a dual-element fuse with long time delay, will blow in about 20 sec. A dual-magnetic air circuit breaker will operate in from 10 to 30 sec., depending upon the setting of its overcurrent element.

As the five-time loading example is typical of time differential existing between duct and device, there is no possibility of duct exceeding its maximum permissible temperature.

Second Consideration

The second consideration is closely allied to the first. We have shown that short time overloads are a common occurrence on bus duct and that the effective (heat-producing) current can be allowed to approximate the actual current rating of the duct. The protective device, therefore, must function properly under the severe duty of carrying near *its own* rated load.[1] Many types of protective devices create heating problems under these circumstances.

Specifically, copper parts or enclosures for protective devices can be annealed, charred or otherwise impaired because of contact troubles arising from excessive heat generation. The problem becomes more serious because each point affected by heating becomes, in turn, a new source of heating. If this cycle is allowed to continue the inevitable result is irreparable damage to device enclosures, contacts, etc.

Also, certain protective devices exposed to temperature higher than normal, either by the elements within themselves or by increased ambient temperatures, change their overload operating characteristics

Two Types of Bus Duct are Combined to Form the Pattern

FEEDER DUCT: Feeder Duct, 1, is of low impedance type to minimize voltage drop in this main trunk run. Bus bars in low-impedance duct are closely spaced in a configuration designed to neutralize fields and thereby reduce reactance. Bars are wrapped with insulating tape or are otherwise insulated and are supported in the casing by insulator blocks. The casing is generally ventilated to provide maximum heat dissipation.

Two, three and four pole ducts are available in capacities from 600 to 4000 amp., 600 v. or less. To improve voltage regulation, resistance welders and other large inductive loads are frequently served directly by low impedance duct. Feeder duct is also adaptable to verticle risers and weatherproof types are approved for outdoor use.

PLUG-IN DUCT: Protective devices for branching plug-in duct runs, 2, can be placed at any feeder-duct joint but plug-in duct is also often employed independently. Basic purpose of this type duct is flexibility in the arrangement of productive equipment. Bus plugs for load tap-offs can be readily inserted at any of the plug-in openings spaced along both sides of the duct.

Transformer, capacitor and other special purpose plugs are available as well as fusible switch and circuit breaker tap-off devices. Bus bars of plug-in duct have no physical insulation and proper electrical clearance is maintained by insulator supports spaced along the inside of the casing. Standard duct ratings range from 200 to 1000 amp., two, three and four pole, 600 v. maximum.

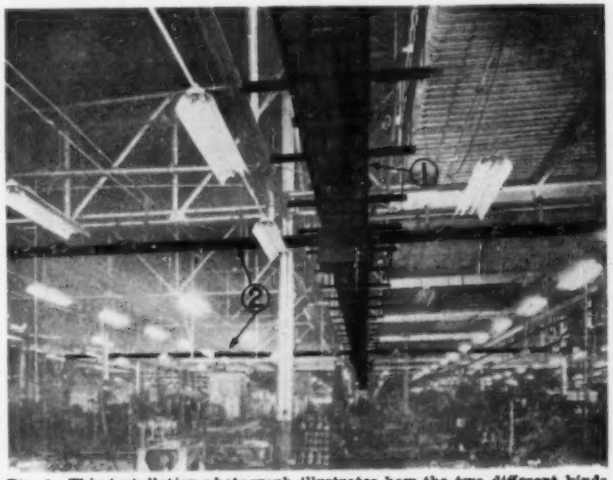


Fig. 1. This installation photograph illustrates how the two different kinds of bus ducts, the feeder and the plug-in, form the common grid pattern

[1] Paragraph 3648 (Article 364) of the 1949 National Electrical Code stipulates: "If the allowable current rating of the busway does not correspond to a standard rating of the overcurrent device, the next higher rating may be used, but not exceeding 150 per cent of the allowable current rating of the busway."

The ratings of bus duct and standard protective devices are closely matched. Consequently, the possibility of using devices of higher continuous current rating than the duct is ordinarily denied and comparisons between different types of devices are premised on equal ratings for duct and device.

Fig. 2. Double fusible-switch cubicle for protection of two separate plug-in duct runs branching from a low impedance duct feeder used in a typical plant

and will fail to provide the desirable time delay.

From this it is obvious that the device should not produce excessive heating when carrying near rated current continuously or be seriously affected by changes in ambient temperatures. *This thermal requirement is the second consideration for the device.*

Short Circuit

The remaining two requirements concern the ability of protective devices to function on short circuit currents. During a short circuit the total impedance of any system is very low. The resultant high magnitudes of current, because of greatly intensified magnetic fields, create unusual mechanical stresses between bus bars. In order to design a system properly, all equipment must be able to withstand the effect of any short circuit which might occur.[2]

The protective device has a further responsibility. It must, in addition to withstanding, be able to open the circuit under its condition of fault. This, of course, is commonly referred to as interrupting capacity and *a prime requisite of any device is adequate IC rating for its application.*

The importance of adequate IC is quite clearly understood and almost always taken into account in selecting protective devices. There is, however, a second factor which is not universally recognized, that is the time element. In relation to bus duct, what is the length of time within which a device must operate on short circuits to give proper protection?

First, we must make allowance for the fact that there can exist, in the conductor system itself, an arcing fault. While an arcing fault will actually present short circuit current of lower value than would a "bolted short" the burning effect of the arc constitutes the most serious problem to be encountered. Permitted too long an existence an arcing fault can burn completely through conductors thus destroying a portion of the system which must be removed and replaced before service can be restored.

Laboratory tests measuring the effects of power arcs in busways indicate that damage will not be sufficient to cause the conductors to fail if the circuit is interrupted within six cycles (0.1 sec.).

The significance of this interruption time should not be underrated. Because air is the main insulation and has the ability to completely replenish its dielectric properties after the power arc has occurred, *the bus duct system can ordinarily be immediately restored to service if fault is interrupted within six cycles.* A brief inspection should suffice to determine what if any repairs may be required to return the system to first class order at the first opportunity.

This is in contrast with other types of systems where physical insulation, when destroyed by arcing, necessitates immediate renovation of the portion of the system affected. Service cannot be resumed on even a temporary basis until repairs are made.

When a power arc occurs the strong magnetic fields about the conductors affect the stability of the arc. In plug-in duct there is no physical insulation about the bus bars to hold the arc at one point. Consequently, if an arc is established, it will travel along the bus bars, the direction always being away from the source of supply[3].

The arc does not remain at any one location long enough to burn away an appreciable amount of conductor. Generally, the most adverse effect is that pits, charred spots and carbon deposits spoil the original smooth surfacing of the bar or bars. Not only does this make good contact difficult to obtain in new tap-offs, but it also weakens plug-in finger connections already there.

Design of duct to protect these vital points, the plug-in connections, varies with the manufacturers. Insulator supports may be arranged so that they partially enclose plug-in points, thereby offering a measure of protection to the fingers. Or insulators may be designed to retard movement of the arc (and so shorten length it could affect) and insulating sleeves employed to shield the contact fingers. In all cases the intent is to minimize damage.

Only a few feet of duct will be exposed to the moving arc if the protective device operates as it should, within six cycles. And it is imperative that on *any* possible value of short this six cycle time be met. This "*any possible value of short circuit*" bears emphasis.

Until quite recently, calculations for short circuit currents involved only *maximum* values, which were used in determining proper IC. It is also extremely important to evaluate *minimum* short circuit currents, i.e., shorts that might, for instance, fall at ends of long runs.

Many devices act more slowly at the lower end of the possible short circuit current range than on higher fault values. Because of this, six-cycle operating time is actually a more critical factor on minimum faults than on maximum.

Simplified calculations for *minimum* as well as maximum short circuit currents are contained in a conference paper originally presented by L. E. Fisher[4].

(Part II will appear next month.)

[2] The mechanical strength of bus duct is great enough to resist stresses resulting from the maximum short circuit current available in most systems. But if advance calculations disclose that short circuit currents available will approach 50 times rating of duct to be used, the manufacturer should be consulted.

It is difficult to arbitrarily assign specific short circuit ratings to bus duct which would have broad meaning. There are no standard procedures set up to conduct industry-wide tests and no exact method of determining just how much damage constitutes failure and no criteria for measuring such damage. For these reasons, the individual manufacturer is the best authority on the suitability of his product in the application in question.

The manufacturer can advise if standard duct will be able to withstand the possible value in the application. Where conditions require additional short circuit strength, duct can be reinforced by increasing supplementary bracing, etc.

[3] The fact that bus bars in plug-in duct are unwrapped does not, by itself, indicate a susceptibility to power arcs. The assumption that air may readily lose its dielectric properties is incorrect.

Even severe atmospheric conditions such as extreme humidity, heavy dust, corrosive vapors, etc., will not cause dielectric failure of the insulating air. Invariably, the cause of any power arc will prove to be the result of direct contact of foreign conducting material accidentally bridging between opposite phase bus bars (or between one phase bar and casing).

[4] At the AIEE Midwest General Meeting at Chicago Nov. 3, 1947. This paper was primarily written to present and explain simplified short circuit calculations as related to bus duct. The section covering maximum short circuit currents translates the per cent impedance method of calculation into per cent factors applicable to electrical system components such as primary system, transformers, bus duct runs and feed back currents.

Strongly stressed, however, is the importance of properly evaluating **minimum** short circuit currents. The discussion takes into account the possibility that shorts could occur at ends of long branch runs and that these could be single phase shorts. The impedance introduced by power arcs and their effect in calculations is also considered. This information is correlated with burning characteristic of the arc and the time in which portions of bus bars can be destroyed by this burning.

GROUTING PRACTICE—

The "How, Why and What" of This All-Important Link Between the Machine and Its Foundation

By **LEON A. WATTS,**
Manager, Service and Erection Dept., Allis-Chalmers Mfg. Co.

GROUTING HEAVY equipment to its concrete base is simply a means of extending the main foundation and has been used by engineers since the introduction of machinery. In addition to minimizing vibration, grouting also provides a sound mooring for machinery which prevents machines from shaking loose from the foundation during operation.

Because the foundation seems such a basically simple requirement of proper machine installation practice, some of the preparatory steps are often considered too trivial for more than a passing thought. Yet experience reveals that each step, no matter how insignificant it may seem, cannot be overlooked. Oversight, negligence compromising the least of these requirements may cause the foundation to crack or crumble under strain, resulting in the unnecessary expenses of time and money to correct mistakes which should never have been made in the first place.

Preparation of Foundation

A clear surface is one of the prime requirements of proper grouting. Concrete foundations must be thoroughly cleaned and wetted before grouting is started. The foundation loading surface should be chipped with a pneumatic chipping hammer, using either bull or spade point chisels, or resurfacing may be done with a hand bush hammer, if air tools are not available. But all inert and foreign materials, as well as glazed or finished surfaces must be removed from that portion of the foundation upon which the grout is to be placed. It should be quite helpful whenever possible, to wet sand-blast the grout area of foundation or subject it to high pressure hydraulic jet action in order to remove dust and loosen any inert particles.

Another requirement is that foundations less than 28 days old should be kept wet for at least 12 hr before grout is poured. For foundations more than 28 days old, the wetting period should be extended to a minimum of 24 hours. Foundation surfaces must be thoroughly saturated to assure a good bond between concrete and grout and also to prevent loss of water from grout through absorption. However, it is equally important to remove all excess water from the original concrete surface before grouting.

Since it is quite impossible to obtain a good bond between grout and foundation, where oil, grease, paint or similar foreign matter exists, these stains must be removed from the surface. A caustic or some other neutralizer may be used to eliminate them. They may also be removed by chipping the oil soaked areas sufficiently deep so that no oil or grease will contact the grout. This procedure should be used on all horizontal surfaces. Figure 1 shows a properly prepared foundation.

Vertical and sloping surfaces steeper than 45 deg should be washed free of dirt, oil and grease. If chipping is necessary, surfaces should remain as smooth as possible to prevent grout from spalling and leaving a loose, shattered area between the original concrete and grout.

Preparing Machine Bases

Machine bases and sole-plates, before being finally positioned, should be thoroughly cleaned of roll scale, rust, paint, or grease. When using sole-plates, and it is necessary to slide machine for final alignment after the grouting is completed, it may be expedient to use a lubricant between the sole plate and the machine base. This may consist of a light coat of paraffin or a small amount of flake graphite. Oil or grease are not recommended because the weight of the machine may squeeze out the excess and cause it to run down over the surface of the grout, thus preventing grout from bonding.

All metal surfaces or areas that contact grout should be wetted immediately before grouting is started. This prevents the absorption of water from the grout and also acts as a lubricant to enable grout to flow around and under the various foundation bolts and machine parts.

This is the first of a two-part article by Mr. Watts dealing with entire procedure to be followed in grouting. The second part will appear in a forthcoming issue of Plant Engineering.

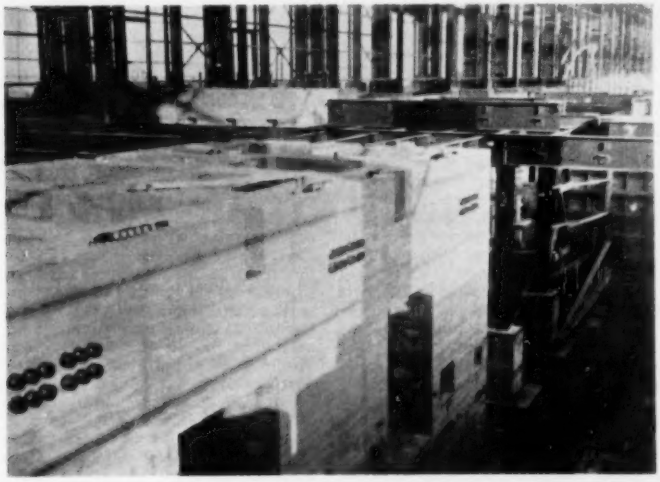


Fig. 1. Foundation for steel mill driving motors. Surfaces have been roughened with a chipping hammer, wire brushed and saturated with water. Foundation is now ready to receive steel mill motors and gear drives after which the equipment will be grouted into position. Foundation was cleaned off by water jets

All forms built around machine bases or sole plates should be made of lumber at least 1½ in. thick and securely braced to resist bending or slipping when sustaining the load of the fluid grout. Top of the forms should be at least 6 in. above the bottom of the sole plate or machine base to assure a head pressure on the grout during the setting process. A coating of paraffin or flake graphite used solely to prevent grout from adhering to the side walls of the equipment may be applied to that portion of the machine or equipment which will be submerged in the surplus grout. By reason of this simple step surplus grout may be easily and economically removed after removing the forms.

The actual mixing and placing of grout mixtures are equally as important as the preliminary preparations. Mixtures and methods of placing them vary from job to job and should be made and applied according to particular requirements.

A generally applicable mixture may be obtained by mixing one part cement and two and one-half parts of manufactured or angular sand or three parts of smooth rounded river sand. The water cement ratio should not exceed 50 per cent by weight unless this W/C ratio cannot be properly placed. When greater flowability is needed, the water content of the grout should be increased. Low water-cement ratio minimizes shrinkage and assures greater strength and durability to withstand freezing and thawing, shock, high impact loads, and extreme vibration, but may require more spading or agitation to make it solid.

Approximately 17 lb or 17 per cent of water is sufficient to hydrate 100 lb of cement completely. Water added to grout or concrete in excess of this amount is used for lubrication only. Most of the excess water is lost by bleeding after the grout is in place. This loss accounts for approximately 80 per cent of the shrinkage in grout and concrete and also reduces their durability and impermeability.

Surplus water and air can be eliminated by rodding or spading after the grout has been poured and allowed to settle for half an hour. Rodding equipment may consist of a suitable length of hoop-iron placed beneath the case to work or churn the mixture by long strokes, or by using a suitable quantity of homemade chain with links made of wire 1/16 in. or 1/8 in. thick, as shown by Fig. 2. In short, plain telephone wire.

Chains, which are placed between the machine base and foundation before the grout is poured, are worked back and forth during and after the pouring to force out surplus water and air from between the sole plate or base. To economize on chain, a piece of wire may remain in the grout.

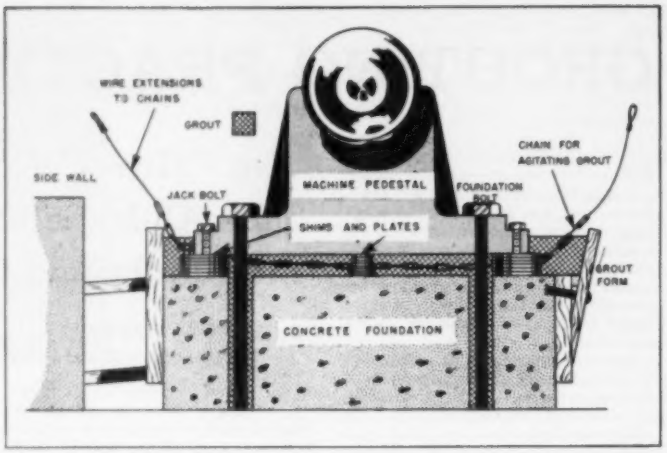


Fig. 2. Installation showing typical components and displacement of elements used in grouting. Note wire chain and wire extension used for agitating grout

The distance between the top of the foundation and the bottom of the sole plate or machine base determines whether one of two mixes of grout should be used. Sole plates or machine bases up to 2 ft wide, irrespective of length, should never have less than 1½ in. of grout space at the closest point between base and foundation. For thin grout, the mixture should be one part cement to two and one-half parts clean, sharp or manufactured sand or three parts of round, smooth or dull river sand, with sufficient water to assure a free grout flowage which may be agitated with the grout chains.

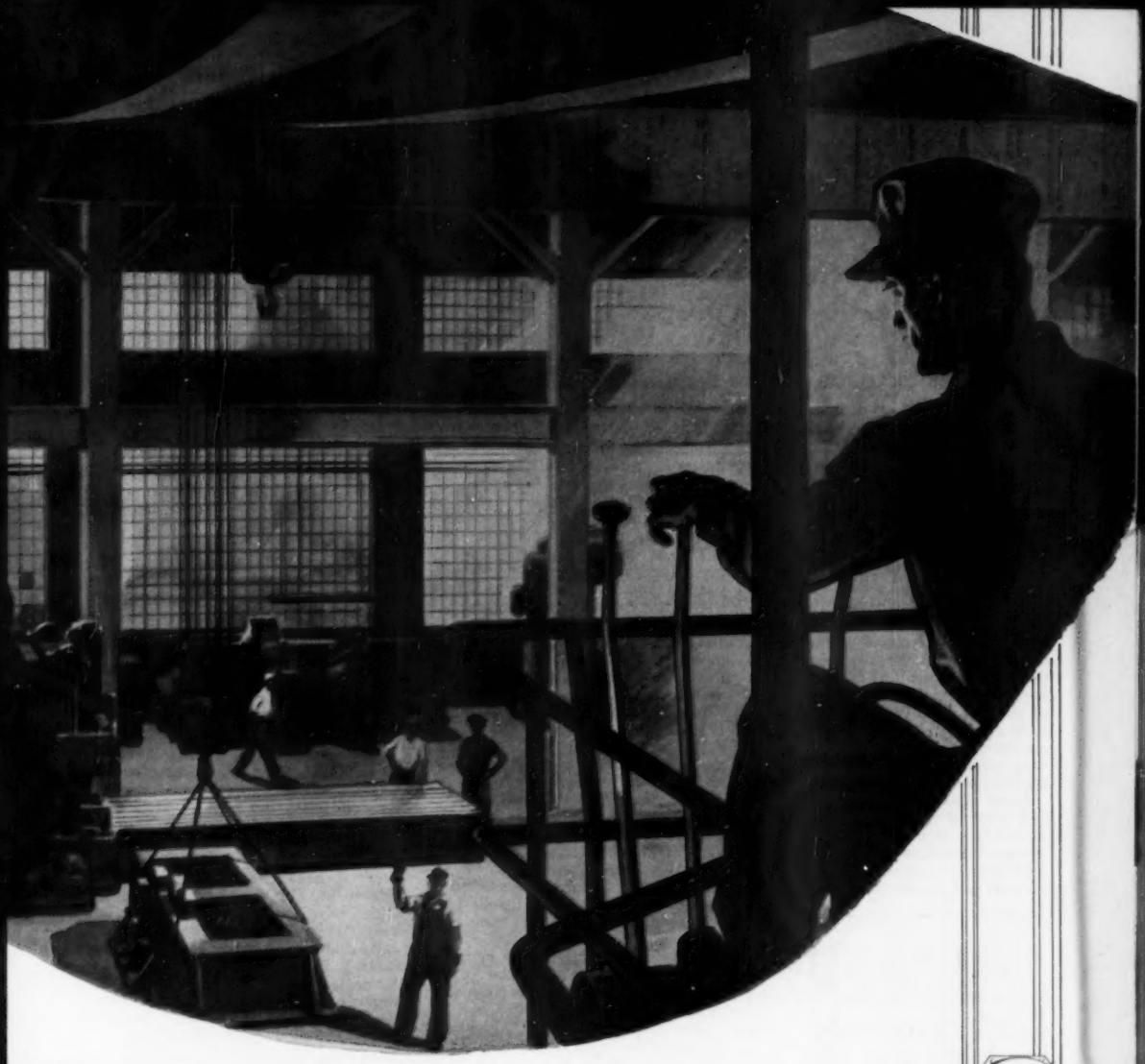
For widths exceeding 2 ft, the depth or thickness of the grout must be increased to 4 in. or, in some cases, up to 6 in., depending upon the area to be grouted. On deep grout, mix consists of one part cement, two and one-half parts clean, rounded river sand or two parts angular manufactured sand or milled stone manufactured sand, and three parts of 3/16 in. to 3/4 in. screened smooth river gravel or two and one-half parts of ¼ in. to ½ in. crushed and screened stone. Stone or river gravel passing a 1¼ in. mesh may be used for a 6 in. grouting space. The edge of the grout should be kept wet and covered with sacks for several days, depending upon local circumstances of humidity and temperature after which a good commercial curing compound should be applied. If the foundation and grout are subjected constantly to high humidity or water, the contact joint between the sole-plate and the foundation should be sealed with coal tar or paint with several coats of thick paint.

Very satisfactory results may be obtained from using dry packed grout wherever possible because of its low percentage of shrinkage and the small amount of water needed. A mortar consisting of one part cement and two and one-half parts of sand thoroughly mixed dry before adding water produces best results in this type of grouting. Just enough water should be added so that if grout is placed in a standard metal water bucket and the pail is removed while in an inverted vertical position more than two-thirds of the grout will remain standing. If it does not stand, more cement must be added to enrich the batch. The grout should be caulked in with 4-in. wide boards of suitable thickness, depending upon the thickness of the grout. Add cement to batch if it is too thin, unless it must be used thin.

The forms may be removed after the grout has set for 12 to 24 hr at a temperature not lower than 70 F. The setting period should be longer if temperature is appreciably below 70 deg. After the forms have been removed, the surfaces are smoothed with a surfacing stone and pointed wherever faults, cracks or spalling may have taken place. For turbine and engine foundations subject to relatively high temperatures above ambient or surrounding room temperatures; also high humidity or condensed water from steam leaks or otherwise, or where exposed to rain, water or snow, such as for pumps, and cement and crushing machinery, the grout joint must be thoroughly sealed with paint or coal tar against penetration of water from condensation or capillary action. When these conditions exist, there is a tendency, without such precautionary measures, for corrosion to develop on steel sole plates or steel base, which, in turn, causes lifting with resultant misalignment from deformation.

It is absolutely necessary to let grout set for at least two weeks before equipment is placed in opera-

(Continued on page 90)



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SELECTION, USE AND CARE OF TOOLS

Cold Chisels—They have a tough job to do so make sure you get good quality tools and handle them properly

By THOMAS TRAIL, Maintenance Engineer

ONE OF THE MOST used and abused tools in the shop kit is the cold chisel. The abuse is unfortunate and results from lack of knowledge of proper tool use and failure to appreciate the care with which a chisel is designed and made.

Chisels come in a variety of types and sizes, and in several grades of quality. It is important that good judgment be exercised in selecting the proper types and sizes in accordance with the uses to which they will be put. As for quality, it is never advisable to purchase tools of inferior quality for shop use as such tools will have a short and unsatisfactory life. Only chisels of first quality, or at least medium quality, should be chosen.

Good chisels are made of alloy tool steel of the proper composition to produce strength and toughness, essential qualities in a tool that must withstand severe use. The metal is forged and drawn to shape under power hammers. This further refines the grain of the steel. By forming chisels at low temperature the carbon in the metal is preserved. This insures strength and lasting qualities in the steel.

The hardening and tempering of high quality chisels is another important factor. If made too hard they will break, and if made too soft they will flatten. Scientifically controlled tempering insures the best degree of hardness and toughness for long service in varied types of work.

Medium quality chisels are made of high grade carbon tool steel, carefully hardened and tempered, and are satisfactory for work that does not require great accuracy or impose severe stresses on the cutting edges.

Proper chisel design is also important since it insures balance. This makes the tool more comfortable to use and permits more accurate work to be done. Some of the better grades of chisels have square shanks to prevent their rolling on inclined surfaces.

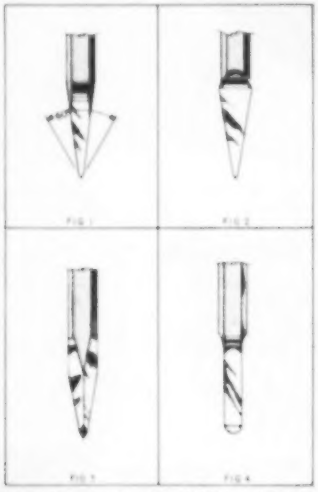
Chisels are made in five principal types. These are the Flat, Cape, Diamond Point, Round Nose and Rivet Buster.

The Flat Chisel, Fig. 1, generally is available in cutting edge widths from $\frac{1}{4}$ in. to $1\frac{1}{4}$ in. or wider. This is the most commonly used type and is employed for general metal cutting. The shank or stock usually the same width as, or narrower than, the cutting edge.

The Cape Chisel, Fig. 2, is made in cutting edge widths from $\frac{1}{4}$ in. to $\frac{3}{4}$ in. This type chisel is generally used where a narrow cutting edge must be combined with maximum shank strength. The stock of a cape chisel is much wider than the cutting edge.

The Diamond Point Chisel, Fig. 3, comes in point widths ranging from $\frac{1}{8}$ to $\frac{5}{8}$ in. This chisel is used principally for removing broken pipe ends, bolt ends and similar work, where a sharp pointed tool is required to dig into the metal.

The Round Nose Chisel, Fig. 4, is available in $\frac{1}{4}$ to $\frac{3}{8}$ in. cutting edge widths. This chisel is used for cutting grooves in metal, especially for the grooving of oil-lubricated sleeve bearings.



Four types of cold chisels: the flat chisel, cape chisel, diamond point chisel and the round nose chisel. All of them are designed to do specialized types of work with the exception of the flat chisel which is used for all-around work

The Rivet Buster Chisel, Fig. 5, is designed, as its name implies, for the removal of rivets by the shearing off of the heads. Cutting edge widths range from $\frac{5}{8}$ to $\frac{3}{4}$ in. and lengths are usually about twice that of regular flat chisels.

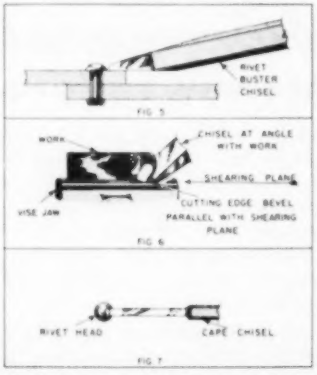
Cold chisels should be held firmly and struck solid, even blows with a moderately heavy hammer. Always employ a chisel large enough for the job and use the center of the blade, not just one corner. In shearing light metal, clamp it in a vise, as shown in Fig. 6, and hold the chisel so that one level of the cutting edge is parallel to the shearing line and the chisel shank is slightly horizontal.

In cutting through flat metal, back up the metal with a solid metal block, and cut lightly at first until a shallow groove has been formed along the entire distance to be cut. Then apply hard blows with a heavy hammer, cutting from one or both sides of the metal. The backing-up block should always be of softer metal than the chisel.

In the absence of a rivet buster chisel, rivet heads may be removed with a narrow edged cape chisel, as shown in Fig. 7.

A cold chisel is designed to cut only metals softer than the chisel itself. Never attempt to cut spring steel, hardened metals, drill rod, as it will damage the cutting edge.

Chisel manufacturers usually recommend that the cutting edge be sharpened with a file when necessary, keeping the cutting edge centered and carefully maintaining the original bevel, usually 60 deg as shown in Fig. 1. Never grind a chisel to re-edge it, as the temper is very likely to be damaged. Where chisels are customarily redressed by forging, it is advisable to obtain information from the manufacturer regarding the correct forging and drawing heats and the proper method of hardening and tempering.



Application of these tools and the methods of application are important to fast, accurate work, long tool life

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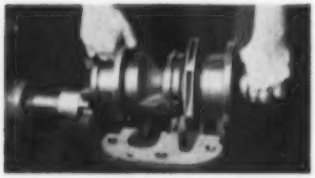
The GS Pump has been designed from the ground up to fit company's service and exchange plan. All parts, except casing, are in the rotor assembly. When maintenance is necessary you simply remove the cover and end plate studs, lift out the assembly and drop a new one in place.

New rotors are ready for immediate shipment from stock, and when you return the old one you get full credit for



serviceable parts. Or, you can exchange the entire pump for a factory-rebuilt one, with credit for parts.

Plants with their own maintenance crews and stocks of spare parts will find this pump design convenient. Casing is horizontally split for easy access without breaking piping connections. Parts are interchangeable and available for shipment from factory.

Other features of the pump are simple mechanical seals and pre-lubricated bearings. Furnished in three sizes for capacities to 450 gpm, heads to 230 ft. De Laval Steam Turbine Co., Trenton 2, N. J.

LIQUID LEVEL METER

Is pneumatic unit, for measuring liquid levels from 14 to 120 in.

With this pneumatic transmitter you can measure levels in practically any tank or container and the working pressures are suitable for most applications. It utilizes buoyant force on a partly immersed cylinder and needs no purges or liquid seals. Company engineers say it can be operated for long periods with almost no maintenance and affords extremely close control.

Unit is intended for use with liquids of various specific gravities and viscosities and at working pressures up to 600 psi at 450 F. Brown Instruments Div., Minneapolis-Honeywell Regulator Co., Wayne and Roberts Aves., Philadelphia 44, Pa.

ELECTRIC INSULATION

Is developed from a new plastic that won't support combustion

Flammability has been a characteristic disadvantage of many plastics with good electrical properties, but tests with Rulan are reported to show that it won't burn after the flame has been removed . . . or drip when molten.

Rulan has a power factor, over a wide range of frequencies, of 0.002, and a dielectric constant of 2.7. This new plastic insulation is said to be non-tracking and to retain its electrical properties after immersion in water for long periods at high temperatures.

Rulan can be extruded onto wire at high speeds; or injection molded. It is available in commercial quantities and molded electrical parts, and electrical tape are being developed for uses where flammability must be taken into consideration. Polychemicals Dept., E. I. du Pont de Nemours and Co., Inc., Wilmington 98, Del.

CONVEYOR BELTS

Come in two qualities, for light or more severe oil service

Now on the market are two new brands of oil service conveyor belts—Oil Resisting and Super Oilproof. The former is intended for light oil service, for transporting grain, oil-treated coal and other materials with light oil characteristics.

Super Oilproof is especially designed to handle low viscosity oils, plasticizers and solvents. Company says it will give maximum service life when conveying plasticizers, corn and pine oils, machine cutting oils and asphalt compositions, and recommends it for use where combinations of oil and high heat are found. The B. F. Goodrich Co., Akron, Ohio.

PLASTIC HOLDERS

Protect and preserve valuable plant records, production data

V.P.D. Transparent Plastic Holders keep records, shop orders and blueprints from getting messy, mutilated and unreadable. These holders are made of sturdy cellulose acetate with durable leatherette backings and bindings. Some have both sides plastic; others have leatherette back and plastic front.

Data is easily slipped into the holders—then it can be passed from department to department and kept clean. A variety of types and sizes are available. Joshua Meier Co., Inc., 153 W. 23rd St., New York, N. Y.

SELF PRIMING PUMP

In sizes from ¼ to 5 hp, available with open and closed impellers

This new line of centrifugal self-priming pumps may be had in capacities to 120 gpm and heads to 135 ft, depending on capacity, and suction lifts to 25 ft. Manufacturer stresses that their design affords positive self-priming and incorporates no valves, no large reservoir, no re-circulation of water during pumping stage. Goulds Pumps, Inc., Seneca Falls, N. Y.

ADJUSTABLE WRENCHES

Of lightweight alloy steel, drop forged for heavy duty usage

The OTC Slim Twins are two adjustable wrenches engineered to cover a total of 29 standard wrench sizes.

Manufacturer says the design of these thinner, lighter weight wrenches gives added strength in leverage points where it counts most for long service.

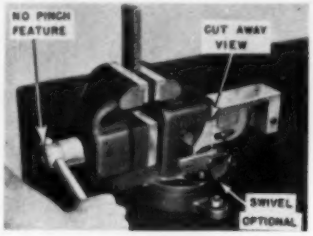
The smaller twin, the OA-24, is 24 in. long, ⅞ in. thick and weighs only 10 lb. It adjusts to 13 sizes from 1⅜ to 2⅞ in. The OA-36 is 35 in. long, 1⅛ in. thick, weighs 22 lb and adjust to 16 sizes from 2⅛ to 4¾ in. Wrenches cost $37.50 and $61.25. Owatonna Tool Co., 373 Cedar St., Owatonna, Minn.

MACHINIST'S VISE

Offers fast slide action and a non-pinch handle feature

A real time-and-motion saver, the Slide-Set Vise opens or closes to any position through a push-pull action which eliminates spinning the handle.

The slide action is simple. Give the handle a turn and a half counter-clockwise and the jaw slides in "neutral" to any position. Then, as soon as the work



is engaged, you give the screw only a short, final tightening in the usual way.

The handle is specially designed to keep the operator from getting pinched between thumb and forefinger if he lets the handle drop. Vise is built of high-strength steel parts and semi-steel castings in 4 in. size. It weighs 58 lb and is available with either swivel or stationary base. Dodge Mfg. Corp., Mishawaka, Ind.

SNAP-ACTION SWITCHES

Small and lightweight, for control, limit and safety applications

The Electro-Snap—a small snap-action switch developed for aircraft during the war—is now available in a broad selection of operating characteristics and actuating devices for industrial use.

Manufacturer says the positive, snap-action of contacts is fast, arcing is reduced, and there is no dead center position. Switching action is independent of actuator speed. Other advantages claimed are accurate repeatability, long contact life, double-break contacts. Electro-Snap Div., The Exhibit Supply Co., 4218-30 W. Lake St., Chicago, Ill.

HORIZONTAL CIRCULATOR

For forced hot water heating systems, offers quiet operation

The HDH Circulator is a horizontal type built for high capacity performance for high resistance insulations. It has a porous bronze bearing, rotary seals, motors with overload protection, and designed for easy servicing.

Circulator is supplied with ¾, 1, 1¼ or 1½ in. interchangeable flanges, and it pumps at 20 gpm against a 10-ft head. Taco Heaters, Inc., 137 South St., Providence 3, R. I.

The three six inch scraper strainers shown above are insuring a usable water supply 24 hours a day in this busy Detroit paper mill—it is river water which at times is full of debris. Pressure gauges tell the operator when the strainer needs scraping. Then, a few turns of the handles remove all material from the screens and the water pressure becomes normal again.

There are many uses for this Sarco product. Foods and chemicals are run through screens of varying sizes just before packaging. Hot liquids, such as wax and auto frame paint, are purified, and the exhaust steam containing lint from steam hammers is made suitable for use in unit heaters in a large Cleveland metal plant.

Scraper Strainers are available in sizes from ¾" to 8", up to 200 lbs. pressure, hand or motor operated. Bodies, screens and rotors can be made of any metal needed for the application. Ask for Catalog No. 1225.

PAINT FILLING

VARNISH

STEAM

OIL

HOT WAX

327

SARCO
SAVES STEAM

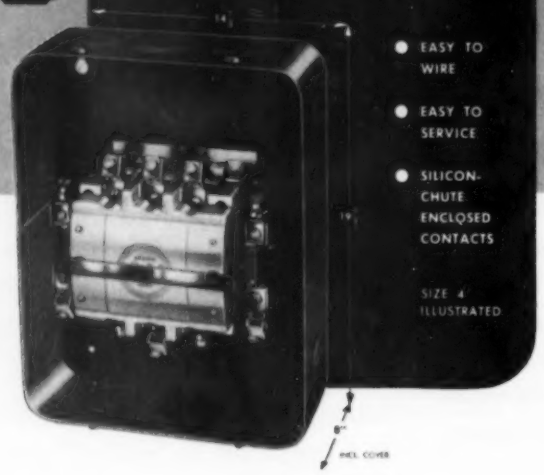
SARCO COMPANY, INC.
Represented in Principal Cities
Empire State Building, New York 1, N. Y.
SARCO CANADA, LTD., TORONTO 5, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT

NEW SIZE 4 "RA" MAGNETIC STARTERS

ARROW AH HART

1/2 CONVENTIONAL SIZE



- EASY TO WIRE
- EASY TO SERVICE
- SILICON-CHUTE ENCLOSED CONTACTS

SIZE 4 ILLUSTRATED

SMALLEST SIZE 4 ON THE MARKET — Patented "RA" (Right Angle) Balanced mechanism cuts space in half. HIGH ARC RESISTANCE — Long arc path; silicon-chute enclosed contacts, shaped to force arc to extinction. EASE OF WIRING AND SERVICING — Straight through wiring, plenty of working space in the box; terminals front-wired; line and loads connect at opposite ends. 4-PILLAR ALIGNMENT — Assures straight line action, greater stability. FOR ITS SPACE-SAVING FEATURES, FOR ITS WORK-SAVING FEATURES, THE NEW AH SIZE 4 "RA" MAGNETIC STARTER IS THE SENSIBLE ONE TO SPECIFY AND BUY.

Write today for literature on Arrow-Hart Type "RA" Magnetic Starters, available in local and remote control or selector switch types — all sizes.

CONTROLS and APPARATUS FOR *Outstanding* PERFORMANCE

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THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
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BRANCHES IN: BOSTON, CHICAGO, CLEVELAND, CINCINNATI, DALLAS, DENVER, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA, SAN FRANCISCO, SYRACUSE
IN CANADA: ARROW HART & HEGEMAN (CANADA) LTD., MT. DENNIS, TORONTO

FLAME SPRAY METHOD

For applying polyethylene coatings on steel tanks, equipment

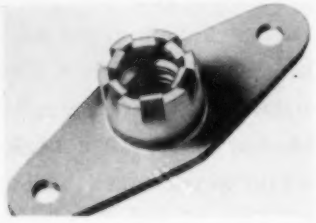
This new process is credited with giving greatly increased corrosion protection—and of producing a coating that's odorless, taste-free and non-toxic, adaptable for use in chemical, food, petroleum and metal working industries where severe corrosion problems exist. It applies coating in thicknesses from $\frac{1}{32}$ to $\frac{1}{4}$ in.

After the tank to be coated has been sandblasted, polyethylene in powder form is blown through specially designed flame spray equipment and deposited on the tank in melted form. Company will coat existing equipment by this method, supply new coated tanks or send equipment and personnel to your plant for applications. Houghton Laboratories, Olean, N. Y.

SELF-LOCKING NUT

In 8/32, 10/32 and $\frac{1}{4}$ in. sizes, for use from below zero to 550 F

The Plate-Lok uses company's Hex-Lok principle, until now available only in the hexagon-type nut. Essentially two nuts in one, the Plate-Lok's top (locking) section is formed by depressing six threaded flanges inward and downward, so they press against the



body of the bolt, without distorting or breaking bolt threads. These flanges are held by tension in this out-of-phase condition and return to a depressed position when bolt is removed.

The Hex-Lok principle is designed to permit one-piece all-metal construction. This design is also intended to permit control of torque values. Boots Aircraft Nut Corp., John St., Stamford, Conn.

INTERNAL WRENCHES

For use on pipe, tubing, fittings and electrical conduit

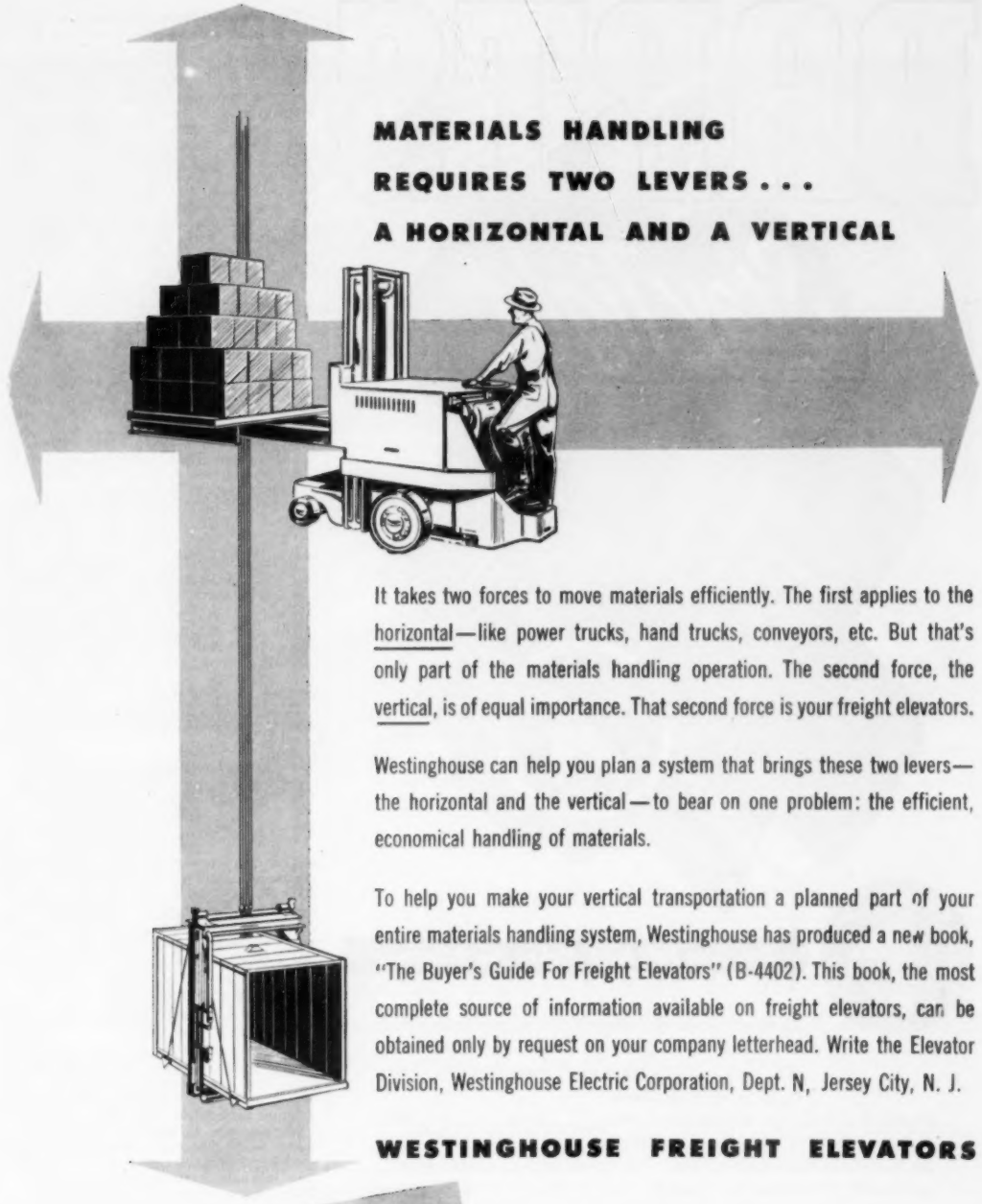
Now available in 12 sizes from $\frac{1}{8}$ to 4 in., these wrenches can be used for either installation or extraction of fittings in close quarters. They're said to be especially suited for getting out worn or broken fittings from hard-to-reach places, and for use where the exterior of the pipe can't be marred or scratched.

Wrenches are made of heat-treated alloy steel for strength and available for use with standard, as well as extra heavy and double extra-heavy pipe. Roddick Tool Co., 112 Rochester St., Cosa Mesa, Cal.

COMPARATOR

Is twin-dialed time-saver for selecting fabricating materials

Comparing material costs and properties is easy—and quick—with the Comparator. This tool is a two-dial ready reference guide to facts and figures on plastics and 11 other structural and fabricating materials.



MATERIALS HANDLING REQUIRES TWO LEVERS . . . A HORIZONTAL AND A VERTICAL

It takes two forces to move materials efficiently. The first applies to the horizontal—like power trucks, hand trucks, conveyors, etc. But that's only part of the materials handling operation. The second force, the vertical, is of equal importance. That second force is your freight elevators.

Westinghouse can help you plan a system that brings these two levers—the horizontal and the vertical—to bear on one problem: the efficient, economical handling of materials.

To help you make your vertical transportation a planned part of your entire materials handling system, Westinghouse has produced a new book, "The Buyer's Guide For Freight Elevators" (B-4402). This book, the most complete source of information available on freight elevators, can be obtained only by request on your company letterhead. Write the Elevator Division, Westinghouse Electric Corporation, Dept. N, Jersey City, N. J.

WESTINGHOUSE FREIGHT ELEVATORS

YOU CAN BE SURE... IF IT'S Westinghouse

J-98565

DARTS

Stay Tight

This True Ball Joint Makes the Difference

Careful Special Grinding of the seats ensures that every Dart has a joint with true-bearing surfaces. The reason you always get a snug fit and a drop-tight joint with Darts.

Bronze to Bronze. To ensure permanency . . . longer service, *both* seats are made of non-corroding bronze.

Body and Nut are made of high-test, air-refined malleable iron... practically indestructible. Another one of the reasons why you get longer, better service from Darts.

Always specify Dart when you want a union you can depend on.

E. M. DART MFG. CO.
Providence 5, Rhode Island

DART
UNIONS

You simply twist the dials to get comparative cost figures on styrene and aluminum, for example, or any contrast of plastics and other materials. On the reverse side the dials give mechanical thermal, electrical, optical and chemical properties of 12 leading plastics.

Coat-pocket sized, the Comparator tells specific gravity, cost per pound, cubic inch per pound and cost per cubic inch of plastics, molding powder and alternate materials. Similar information is given for films. Qualified plant engineers may have this handy comparator without charge. Plastics Div., Monsanto Chemical Co., Springfield, Mass.

SMALL HEATERS

May be floor set, wall hung or horizontally suspended

The Thermopacs are recent additions to company's line of self-contained, direct-fired industrial heaters. They're made in 100,000 and 200,000 Btu per hour capacities, for either gas or oil firing, with thermostatic control and automatic operation. They are fired either by atmospheric gas burners or pressure atomizing type oil burners. Thermobloc Div., Prat-Daniel Corp., East Port Chester, Conn.

FIFTH WHEEL TRAILER

For handling heavy loads or for long hauls around the plant

An outstanding feature of this trailer is the close coupling afforded—trailers are automatically linked 18 in. apart. There's a special locking device to keep fifth wheel in line and prevent jackknifing.

Of all steel, heavy channel construction, this trailer is described as rugged,

easily maneuverable and requiring minimum maintenance. Its capacity is 6000 lb; size, 36 by 72 in.; height of deck from floor 12¾ in. It has a 30 in. wheelbase and minimum turning radius of 62 in. Market Forge Co., 25 Garvey St., Everett, Mass.

FOUR-WAY VALVE

Has non-interflow feature; in ¼ to ¾ in. pipe sizes

An inexpensive manual valve, the Ardee, is built to control 150 psi air pressure and handle liquid pressures to 1000 psi. The design is a variation of sealing principles used in company's high pressure valves, in which a tubular sealing member slides over the peripheral surface of a rotor to maintain intimate contact during operation. The wiping action of this seal keeps pipe scale and foreign matter from lodging between sealing surfaces.

Valve bodies are aluminum or brass, sealing members are molded of resilient materials. Company reports minimum pressure loss through valve because round internal flow passages are unobstructed and same diameter as nominal pipe size. The non-interflow characteristic is important where infinitely variable throttling is desirable. Barksdale Valves, 4905 Santa Fe Ave., Los Angeles, Cal.

Now, for the New, Modern Instant-Start, Single-Pin Slimline Lamps:

Only EXCLUSIVE "SPRINGLOX" Lampholders Provide All these Cost-Cutting Advantages:

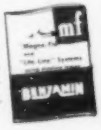
★ One-hand lamp insertion
★ Quicker lamp positioning due to "finding" ring
★ All-metal, one-piece construction—nothing to get out of order
★ Rigidly locked into place, "Springlox" Lampholders cannot be shaken out of line . . . they are always the correct distance apart
★ Positive Protection against lamps working loose
★ Extra Safety due to separate compression spring for holding lamp in position and a separate electrical contact spring, which automatically disconnects primary current when lamp is removed

The MOST MODERN way of plant lighting

instant-start • greater efficiency • lower-cost maintenance

complete range of systems for all industrial seeing requirements!

"Magna-Flo" Units are designed for all T-12 Slimline Lamps 1½" in diameter and 48", 72", or 96" in length. They are available with two-lamp or three-lamp lampholders in individual or in the continuous "Lite-Line" construction. They are available with open or closed-end reflectors and with the diffuser reflectors which have apertures to direct 5% of the light upward and thus cut down brightness contrast. For locations with excessive moisture, All-Porcelain Enamel channels are also available.



Modern, streamlined lighting of factories and shops may now be obtained with these new Benjamin "Magna-Flo" Systems designed for use with the new Slimline Fluorescent Lamps. In addition to the many advantages of the new, long Slimline Lamps, these new "Magna-Flo" Systems also bring to the user the many cost-cutting advantages of the exclusive Benjamin "Springlox" Lampholders. Now available in single-pin construction for the Slimline Lamps, these exclusive lampholders have proven their advantages over 4 years of trouble-free operation and actual use in more than half a million Benjamin Units.

Benjamin Porcelain-Enameled steel open-end or closed-end reflectors are standard equipment on all "Magna-Flo" Units. Benjamin "Life-Time" Porcelain Enamel brings maximum savings in yearly cost through sustained light-reflecting efficiency, ease of cleaning and durability.

Send for free Catalog Bulletin AD 5705 with complete specifications and other data on the new Benjamin "Magna-Flo" Systems. Write Benjamin Electric Mfg. Co., Dept. PE, Des Plaines, Illinois. RS175

NOW! You Can Have KENNEDY DEPENDABILITY on Copper Tube Installations

With the New KENNEDY SOLDER JOINT GATE VALVE

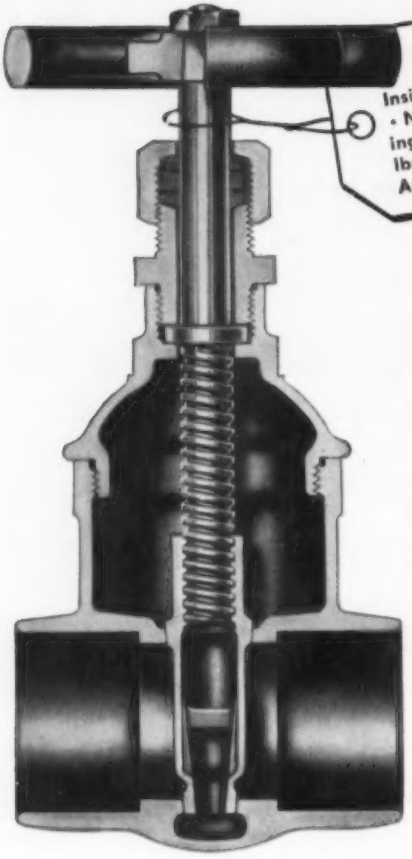


FIGURE 1-SJ
Inside Screw • Wedge Disc • Non-Rising Stem • Working Pressure: Steam 100 lbs.; Water 150 lbs. Sizes Available: ⅜" through 2".

KENNEDY Solder Joint Valves are easily and quickly installed, saving you up to 30% in installation time. They are adaptable to a wide range of services and are specially recommended for general shut-off service on low pressure steam lines and on hot and cold water lines.

When you use this new line of KENNEDY valves you can be assured of the long-lived dependability and positive action that have characterized KENNEDY valves for 72 years.

WRITE FOR BULLETIN 103 containing complete description of the new KENNEDY Fig. 1-SJ Solder Joint Gate Valve . . . complete installation instructions . . . solder data . . . where to use and where not to use solder joint valves . . . table of dimensions and working pressures.

BUY FROM YOUR LOCAL DISTRIBUTOR

THE KENNEDY VALVE MFG. CO.
1072 EAST WATER ST.
ELMIRA, NEW YORK
VALVES • PIPE FITTINGS • FIRE HYDRANTS

OFFICE-WAREHOUSES IN NEW YORK, CHICAGO, SAN FRANCISCO • SALES REPRESENTATIVES IN PRINCIPAL CITIES

PIPE-BOLT MACHINE

Is 185-lb power tool; cuts and threads pipe, bolts, conduit

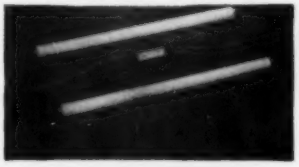
Lightweight, maneuverable and economical to buy and maintain, the Model E has a total capacity to 8 in., is lever fed and smooth operating. There's an outboard eccentric spool steady-rest to prevent "whip" of long lengths of overhanging revolving pipe from rocking the spindle.

The Model E uses same dies, die heads, wheel-and-roller or knife cutoff device, and reamer arm and cone as company's Models A and B. Although designed primarily for smaller jobs, the Model E is useful wherever extreme portability is required. Made with one-piece welded steel base, renewable bronze bushings, aluminum alloy chuck and aluminum housing; removable shake-out tray. Beaver Pipe Tools, Inc., Warren, Ohio.

FLUORESCENT BALLAST

Is trigger-start type, operates two standard 20 w lamps

As near as the eye can detect, this trigger-start ballast starts lamps instantly. This is accomplished, say company engineers, by the inclusion of cathode heating windings in the ballasts. This new ballast requires no starters and



starter blocks in the fixture. It also features a "brickette" to keep noise level to a minimum.

This unit, the Model 89G321, is the first trigger-start ballast for operating two lamps. It's 6½ in. long and 2⅜ in. wide. Others are available for single-lamp operation. Specialty Transformer and Ballast Divs., General Electric Co., Schenectady 5, N. Y.

REVERSIBLE DRILL

Is standard duty electrical unit for use on wood or metal

This electric drill has a built-in toggle-type reversing switch. It turns in reverse at a flick of this switch—eliminates hand turning and struggling to remove the bit.

Originally designed for deep boring in heavy timbers, creosote planking and sappy wet lumber, this reversible tool speeds up a lot of drilling jobs, and is adaptable for use by carpenters, electricians, plumbers, maintenance crews.

Drill has a die-cast aluminum body and weighs 8¼ lb. Its capacity is ½ in. in metal, 1 in. in wood. The a-c d-c 115 v motor develops 550 rpm no-load speed. Cummins Portable Tools Div., Cummins Business Machines Corp., 4740 Ravenswood Ave., Chicago 40, Ill.

LOW-LEVEL BOILER ALARM

"Sings" when boiler water level reaches predetermined point

The Micro-Thermal Low-Level Boiler Alarm consists of a 2⅜ in. expansion tube with its inner end connected to the lower end of the water column on the boiler, and its outer end connected to the upper part by 5/16 in. copper tubing.

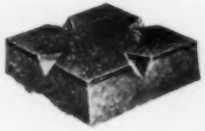
Blue Temper

FEREM FLOORS

Tough Floors for Tough Conditions

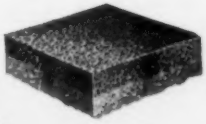
Cement

Notice the porous structure of the ordinary cement floor which is easily subject to crumbling by heavy traffic or shock loads as revealed by the grinding wheel test.



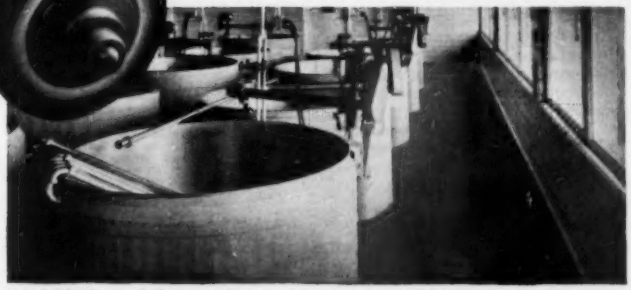
Metallic Hardener

In processed floors using metallic hardeners or metallic plating, the wearing surface is malleable but SLIPPERY and comparatively thin as the wheel test reveals.



Ferem "Blue Temper"

Ferem is the "Blue Temper" component. A dense, ductile and almost diamond hard floor surface results. NON-SLIP and highly wear resistant. The face of the test wheel polishes but does not cut.



20,000 lbs. of Ferem installed at the West Middleton Swiss Cheese Co.

A. C. HORN COMPANY, INC.

Manufacturers of materials for building maintenance and construction—established in 1897

10th Street & 44th Avenue, Long Island City 1, N. Y.

Los Angeles • San Francisco • Houston • Chicago • Toronto

SUBSIDIARY OF SUN CHEMICAL CORPORATION

HORN PRODUCT

GENTLEMEN: PE

Please send complete data on FEREM FLOORS.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

Water rises and lowers above this tube, and when the water level reaches the low point the increased heat in the tube actuates a double throw microswitch. One throw is connected to an alarm—buzzer, bell, howler—and the other may be connected to a boiler fuel cut-off arrangement.

The switch will throw "on" and "off" on a temperature change of only 5 deg F, says manufacturer. The alarm switch, housed in a metal box, can be connected to a single 6-v dry cell battery. J. A. Campbell Co., 645 E. Wardlow Rd., Long Beach 7, Cal.

FORK SHOVEL

To speed handling of coal, coke, broken stone, loose materials

This heavy-duty fork-shovel attachment has tapered tines, 7¾ in. long, which ease their way into and under materials. The hydraulically controlled shovel can be tilted up to 40 deg above horizontal, including 10 deg tilt of the upright assembly, so as to scoop up maximum loads without ramming the stockpile.

Hydraulic controls ease dumping action and a 48-deg dumping angle simplifies load discharge. Actuated by an auxiliary valve, the fork-shovel manipulation has no effect on lifting operation or tilting of uprights.

Attachment is ready for installation on company's gas and electric-battery powered Carloader and Utilitruc models and on two gas-powered Yardlifts. It's interchangeable with other attachments—also available for export sale. Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich.

Hang your headaches on "sky hooks"

✓ SPEED PRODUCTION
AND BOOST PROFITS WITH Richards-Wilcox CONVEYORS

Stove parts entering degreaser on R-W ZIG-ZAG Continuous Power Conveyor.

Been wondering what to do about rising manufacturing costs? Even with plant personnel working at top speed, is your production rate still a problem? Your answer could easily be conveying equipment!

In today's highly competitive markets, plants with R-W Conveying Equipment are operating *more efficiently, more profitably*. Yours can, too!

R-W Conveyors Serve *All* Industry—Richards-Wilcox Conveyor Equipment is a major part of production and processing lines in every imaginable industry . . . increasing efficiency, cutting costs in the handling of light, medium and heavy materials. Why not have an R-W Consultant show you how conveyor equipment, engineered for your production requirements, can step up efficiency and boost profits. Just write or phone the nearest R-W branch office for free consultation—there's absolutely no obligation.

R-W CONVEYORS FOR ALL JOBS

"ZIG-ZAG" Continuous Power Conveyors — Unique powered chain conveyor with extreme flexibility. Designed especially for carrying light loads within confined areas—handles products through degreasers, dip tanks, spray booths, ovens, etc.

"LOCK-JOINT" Trolley Track Over-Way Conveyors — Designed for handling light to medium loads, and maximum flexibility. Maximum capacity 3,000 lbs.

"TRU-TRED" Steel Beam Over-Way Conveyors — For heavy duty handling and electric hoist service with minimum superstructure—eight different track sizes. Maximum capacity 8,000 lbs.

1880 R&W 1950
Reg. U. S. Pat. Off.
OVER 70 YEARS

Richards-Wilcox Mfg. Co.
"A HANGER FOR ANY DOOR THAT SLIDES"
AURORA, ILLINOIS, U.S.A. Branches in all principal cities

HEAT EXCHANGERS

May be operated in either vertical or horizontal position

These graphite shell-and-tube heat exchangers, company's Series 240A Karbate Brand, provide 71 sq ft of heating surface. Among features emphasized are resistance to practically all corrosive fluids, resistance to severe thermal shock, and high heat transfer.

Single, double, or four-pass routing of the tube side fluid is effected by a simple change of fixed and floating and cover assemblies. Maximum recommended hydrostatic operating pressure is 751 psi, maximum steam pressure 50 psi and working temperature 338 F. Tubes can be replaced at the plant. National Carbon Div., Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

V-TYPE FLOOR MOP

Works like a pair of scissors to sweep a wide or narrow path

The V-Mop opens and closes like scissors to let a sweeper clear a path from 6 to 57 in. wide (a smaller size handles 6 to 37 in.). As the mop is pushed over the floor, dirt is forced into the V-shaped pocket formed by the two mop heads.

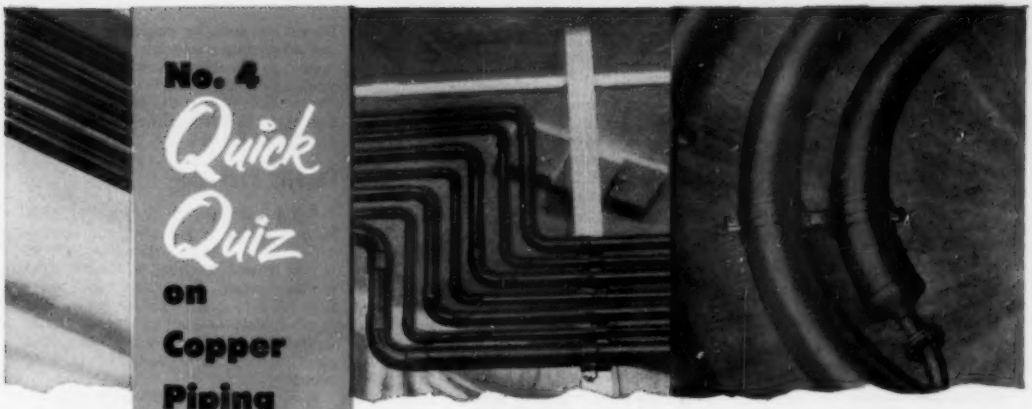
This mop gets dirt and trash out from under desks and machines without being lifted from the floor—the sweeper simply closes the mop-heads around the litter and draws it into the aisle. In the same way he can pick up litter between the mop-heads and dump it into rubbish cans. Refills are available for insertion in the mop-arm channels. G. H. Tennant Co., 2530 N. Second St., Minneapolis 11, Minn.

ROTARY FIXTURE TOOL

Is designed for bending irregular shapes or true radii

This machine bends tubing, bars, extrusions or roll-formed sections up to 8 in. wide, handling bends up to 7 ft dia. It uses a horizontal stationary pressure pad (steel or bronze) which is air operated against a rotating type die head. The die head is mounted on a vertical spindle and gear driven by a 7½ hp variable speed motor. Limit switches and adjustable dogs control degree of rotation of die heads during working cycle. Push buttons permit starting, stopping or reversing cycle at any point.

Bender features open table construction. Its overall size is 4 by 8 ft, and table height is 36 in. Company says the unit requires greasing only every three months. Pines Engineering Co., Inc., 600 Walnut St., Aurora, Ill.



No. 4 Quick Quiz on Copper Piping

Q Does copper tubing lose less heat than iron pipe does?

A Yes. Because of its smooth, reflective surface, heat losses from exposed ANACONDA Copper Tubing due to combined convection and radiation are approximately only half as great as the heat loss from a black iron pipe of the same nominal size.

Q Why is copper tube better for carrying refrigerants?

A ANACONDA Copper Refrigeration Tubing cannot rust and is not attacked by freon or methyl chloride; there is less danger of scale forming and clogging tubing or valves; and leakproof connections are easier to make with copper tubing.

Q Is there more or less danger of bacteria and fungi propagating in copper tubing?

A Less, because the smooth interior and absence of pockets in ANACONDA Copper Tube and Fittings offer less opportunity for lodgement and development of bacteria and fungi.

Q What other undesirable accretions or deposits are prevented or minimized in copper tubing?

A There are many: paper slime, beer stone and milk stone are examples of troublesome industrial deposits in piping which are prevented or minimized in ANACONDA Copper Tube.

Q How can I get advice on copper tubing for my application?

A

Anaconda engineers will gladly advise you without obligation. A special booklet, Publication C-24, containing much useful information is also available. Write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

For better Piping...use **ANACONDA®**
COPPER TUBES

A CLEAN Plant
Is a SAFE Plant

TORNADO*
one-stroke, positive pick-up
Industrial
VACUUM CLEANER

The TORNADO* Method is the accepted, approved method of good "shopkeeping" and preventive maintenance. Reduces plant hazards.

TORNADO* is fast, thorough and efficient. Reduces labor and maintenance costs because one-stroke over the surface is all that is required. No need to waste time by restroking. Picks up wet and dry substances as they come—water, machine oil and other wet substances without machine adjustment. Leaves surface safe for workers. Increases morale. Eliminates health hazards.

TORNADO* does all plant maintenance work with one machine. Motor unit removed in seconds to become a powerful, portable electric blower. Clean dry air blows out dust, dirt, grime and abrasive grit from interiors of motors, machinery and overhead equipment to reduce friction and hold break-down to a minimum. Equipped with tank, it becomes an efficient insecticide sprayer which shoots a fine mist to a distance of 50 feet. May be further converted into a compact, pack-carried vacuum cleaner for use in congested areas and other confined places.

Proved by over 16 years of industrial service to be the most practical cleaner for all plant maintenance. A clean plant is a safe plant.

Bulletin 592 contains complete information. Write for it.

*Trade Mark Reg. U. S. Pat. Off.

BREUER ELECTRIC MFG. CO.
5086 Ravenswood Ave., Chicago 40, Ill.

(Continued from page 30)

Deodorant Lamp Bulb

THE FRESH, clean smell which prevails out of doors during an electrical storm is being reproduced indoors on a small scale by means of a small lamp bulb being introduced by General Electric's Lamp Department.

Ozone, a form of oxygen, is the substance created by nature which has the effect of neutralizing many objectionable odors. Now it is produced at the flick of a switch by a new, four-watt lamp which is designed to dispel unwanted odors. This lamp bulb is expected to find use in many cases where a deodorizing effect is desired.

A glass ball less than an inch and a half in diameter, the new lamp bulb gives off the just barely noticeable concentrations of ozone which are useful in making the presence of odors less perceptible. It operates on household current, and is used with a ballast in a simple fixture which allows the free escape of ozone, but shields the eyes from the ultraviolet energy generated by the lamp.

Although they are expected to find wide public acceptance in homes, offices, and other living and working areas, the first ozone lamps to be produced are being acquired by manufacturers of automatic clothes dryers. They are being built into dryers to give clothes the odor as well as the appearance of cleanliness. The bulbs are also being built into refrigerators and beverage vending machines. In addition, the lamps are seen by engineers as having advantages in such other equipment as heating, ventilating, and packaged air conditioning units. *From GE News, a publication of General Electric Pittsfield Works, Pittsfield, Mass.*

Caustic Packaging

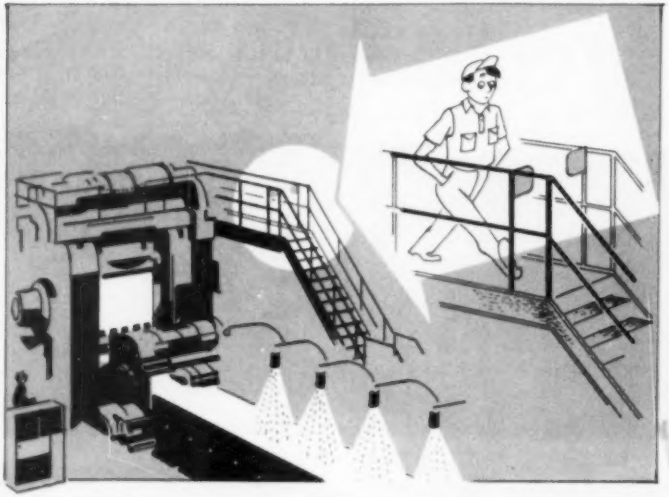
SOLID NICKEL and nickel-clad steel have long been specified for equipment used in the manufacture of rayon grade caustic to avoid iron contamination. To assure the retention of this high quality when the caustic soda is packaged for export in the anhydrous form, nickel plated steel drums have been introduced recently.

It is common practice to use ordinary carbon steel for the drums in which this caustic is shipped. The molten anhydrous caustic is pumped into the steel drums and solidifies upon cooling. During this operation there is considerable iron pick-up from contact with the steel drums, which degrades the caustic to an undesirable extent.

Preliminary tests with nickel plated steel indicated that a thin coating of nickel could be produced economically on the interior surface of the drum. This coating provides adequate protection for the steel and reduces iron contamination so as to maintain the quality of the caustic.

Additional tests were made on the use of thin deposits of nickel on the outside surfaces of the drums, for improved protection during shipment and storage. Exposure tests

Pickpockets Play it Safe



The steelworker above is about to encounter a pair of pickpockets stationed at the head of the stairs. Two small projections will nudge his wrists—by way of reminding him that a hand in the pocket would be better on the railing in case of a misstep. (From Steelways, a publication of American Iron & Steel Institute)

Equitable Building, 120 Broadway, New York. Architect: Ernest R. Graham. Heating and General Contractors for original installation: Thompson-Starrett Co., Inc. Heating Modernization, Consulting Engineers: Franklin J. Leerburger and Joseph R. Weiss. Contractor: Carl E. Joecks. Webster 522 Sylphon Traps (shown in outline) originally installed in the Equitable Building in 1914. Modernized in 1949 with Webster Replacement Thermostatic Assemblies (as shown).

STAR PERFORMERS on Broadway for 35 years

Webster Sylphon Traps, after an unbroken run of 35 years in the famous Equitable Building, 120 Broadway, are continuing regular every-season performance as vital parts of a modern Webster Moderator System of Steam Heating.

There were 4,800 No. 522 Webster Sylphon Traps installed in the Equitable Building in 1914 as part of the original Webster Vacuum System of Steam Heating. In 1949, after 35 years of service, every trap was inspected as part of a heating modernization program and it was found that many of them were still giving *new trap results.* The balance were renewed with Webster Thermostatic Assemblies screwed into original traps without disturbing the piping.

THE NEXT 35 YEARS

In 1949, it was decided to remove the steam and electrical generating installation, freeing valuable space, and to substitute purchased electricity and steam. After checking with 50 leaders in the building management field in New York, the owners of the Equitable Building decided to convert their installation to a Webster Moderator System of Steam Heating. With this System, radiators are always warm. The amount of steam delivered to the radiators is varied automatically through the operation of a Webster Outdoor Thermostat.

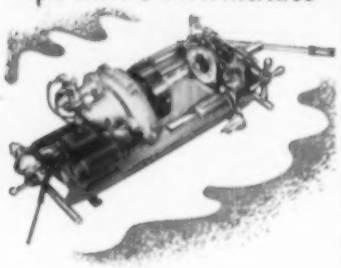
Investigate Webster Heating Equipment – for new buildings or for modernization. A nearby Authorized Factory Representative is ready to serve you. Or address Dept. PE-9.

WARREN WEBSTER & COMPANY, CAMDEN 5, N. J.

Representatives in Principal U. S. Cities : : *In Canada, Darling Brothers, Limited, Montreal*

• LIGHTWEIGHT
• LOW-PRICED
• EASY-TO-MOVE

the New Beaver Model-E Pipe and Bolt Machine



The new low-priced, lightweight Beaver Model "E" is a "junior edition" of the heavy-duty Beaver Model A—which has, for the past 20 years, been the recognized leader in the field of portable pipe and bolt machines.

The Model "E" uses the same dieheads—the same dies—the same patented interchangeable wheel-and-roller or knife cutoff devices—the same reamer arm and cone—as the Models A and B. This will be a great advantage to thousands of shops now equipped with the Beaver Model A or B because it eliminates the necessity of carrying in stock duplicate dies and parts—thereby preventing endless confusion and needless expense. And remember, there are 195 different kinds and sizes of dies instantly available for Models A, B or E.

Although designed primarily for hardware stores and small piping contractors, BIG contractors will find the new Model "E" useful on jobs requiring extreme portability.

A pipe machine is no better than the service back of it and our 50 years of experience in this field, and our reputation for high quality and friendly service, is your best guarantee of complete satisfaction.

WRITE FOR BULLETIN E

BEAVER PIPE TOOLS

216-300 DANA AVENUE • WARREN, OHIO, U. S. A.

demonstrated that the drums finished with lacquered nickel plate withstood storage conditions appreciably better than the painted drums.

Normally when the caustic cake is removed from an unplated carbon steel drum, it has acquired a red color on the surface which shows an excessive iron pick-up. By contrast, when the nickel plated drums are removed from the caustic, the cake has a good uniform natural color with no discoloration. Southern Alakli Corp. has patents pending on this nickel-plated shipping drum. *From Nickel Topics, July 1950, a publication of The International Nickel Co., Inc. New York 5, N. Y.*

From Coal Gas to Gas Turbine

A SATISFACTORY overfeed bituminous-coal gas producer can be made to supply fuel to a gas turbine. Rates of coal gasification of 100 to 200 lb per hour per square foot of grate area can be achieved, resulting in a reasonably small producer.

A total of 93 tests were run, 26 with coke and 67 with bituminous coal. Fuels covering a wide range of ash contents, ash-softening temperatures and caking properties were used. The effect of pressure, rate of gasification and fuel properties for three producer arrangements and modifications, as well as preheat and rapid load changes on operation problems (clinkering, coking, channeling, carry-over and make-gas quality) were investigated.

The tests showed that the response of the producer to rapid load changes is satisfactory. Only the air rate must change substantially in synchronism with the load. The coal feed, the steam addition to the blast, and the ash removal rate can follow the load changes with time lags in the order of minutes. The necessary control equipment is simplified by these producer characteristics.

The tests have indicated that the following features will be required of the producer: 1. A water-cooled wall at least at the oxidation zone to prevent excessive deposit of slag on the retort wall. 2. A substantial coke breaker and stirrer in the top of the fuel bed to prevent fuel stoppage due to arching of the plastic mass and the coke. 3. A clinker-grinding variable-speed grate with proper control to prevent accumulation of clinker with variable load and with variable ash content of the coal.

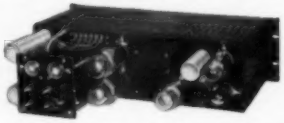
Tests have not yet been run to define sufficiently the features required to avoid tar condensation and plugging due to mixtures of tars and solids. Such tests should be run, but it is expected that the make-gas temperature can be maintained high enough to keep the tar in a dry vapor form and still allow a sufficiently wide range of load to be covered.

IF FLUCTUATING VOLTAGE IS YOUR PROBLEM

STABILINE CAN HELP YOU

STABILINE Automatic Voltage Regulators maintain a constant output voltage, regardless of variations in input voltage or load current. They need no attention—are trouble- and maintenance-free over long periods of continuous operation.

STABILINE Type EM (Electromechanical) is recommended where long-term stability for 24-hour line correction is necessary. Available for 115, 208, 230, 440 volt, 1 and 3 phase ratings; capacities up to 100 KVA.



STABILINE Type IE (Instantaneous Electronic) gives line stabilization of ±0.1%; regulation of ±0.15%. Waveform distortion *never* exceeds 5%. Available in a wide range of capacities.

IF YOU HAVE A PROBLEM regarding the control of voltage in your plant or laboratory, write us about it today — no obligation.

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SUPERIOR ELECTRIC
COMPANY
1609 MEADOW ST.
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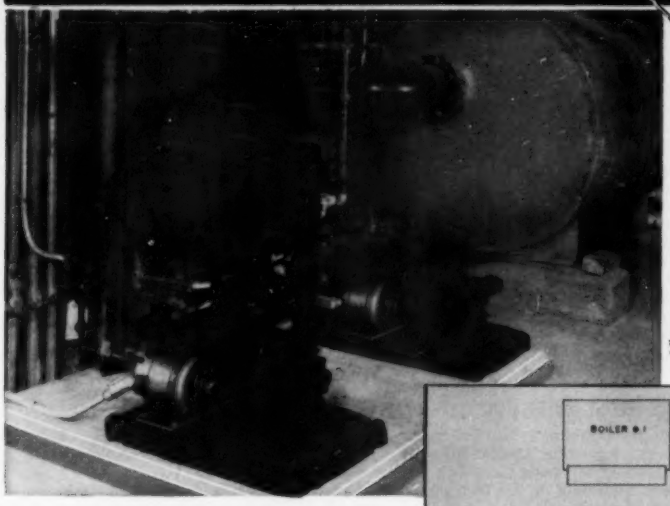
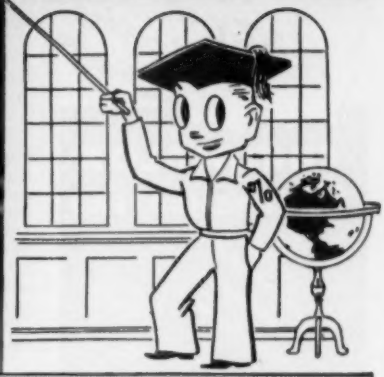
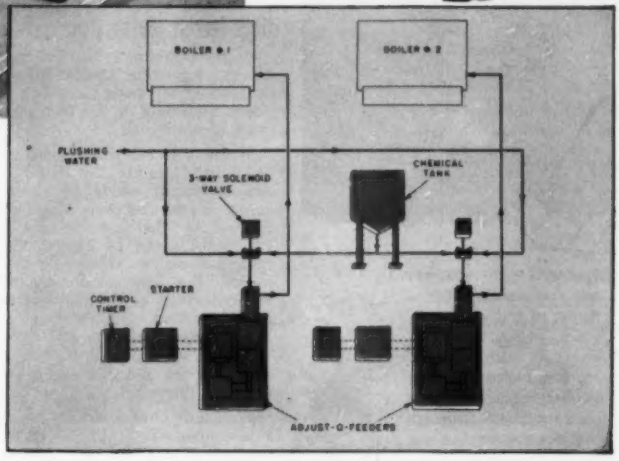
MAKE YOUR BOILER WATER CONDITIONING A ROUTINE OPERATION!







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System is Positive . . . Protecting Your Boiler and Reducing Steam Costs

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At Oberlin College this %Proportioneers% installation automatically provides correct boiler water treatment, adding the proper chemical in the correct proportion, at the right point, at the right time. Chemical treatment as applied by the %Proportioneers% system offers the advantages of improved heat transmission, fuel savings, and greatly reduced maintenance for every power plant from the largest high pressure installation to the smallest low pressure job. We supply complete chemical feeding systems including metering pumps, with control panels, chemical tanks, dissolvers and all other units required. Let us assume full responsibility for your complete chemical feeding system.

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No. 3 in a series on boiler water conditioning.

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Only CHROMALOX gives you such a wide selection of Electric Heaters for heating gases, air, liquids, platens, dies, molds, ovens, soft metals and countless other heating uses. They are easily installed and provide concentrated and "controlled" heat that is dependable, safe, clean and economical.

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CHROMALOX
ELECTRIC HEAT
FOR MODERN INDUSTRY

The carry-over of solid carbonaceous material in the gas at the rates mentioned previously and at pressures in the neighborhood of six atmospheres will be acceptable but will be of such a character and amount that separators will be required. The gas stream from which separation is required, however, is a fairly small portion of the total flow of the gas turbine plant. The gas stream is reducing and will not, therefore, allow separator fires to occur. Thus, the separator problem is not unreasonably difficult.

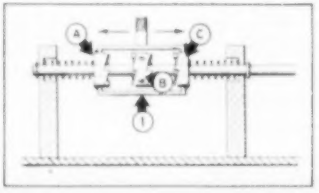
Gasification under the pressures required by a gas turbine has no detrimental effect on the gas quality and has a beneficial influence on the carry-over. It will require, however, the use of coal and ash handling mechanisms with the necessary pressure locks to pressurize the coal stream and depressurize the ash stream. *From a news release of The American Society of Mechanical Engineers, New York 18, N. Y.*

High-Speed Motor Reversal

A METHOD for reversing a small electric motor in three to four milliseconds has been developed by Jacob Rabinow at the National Bureau of standards.

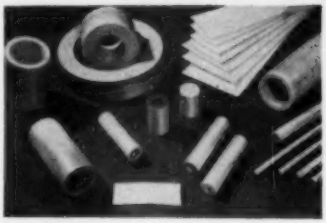
While it is relatively easy to stop a motor quickly by the use of brakes, rapid starts in either the same or the reverse direction are limited by the low torques which can be obtained by electromagnetic means alone. In this rapid-reversal motor, the kinetic energy of the rotor, instead of being dissipated as heat in a brake during deceleration, is converted into potential energy in a spring, which is then used to accelerate the rotor rapidly in the opposite direction.

A small low-inertia two-phase motor operating at 3200 rpm was used. The reversal spring consists of a steel torsion bar approximately 31 in. long and $\frac{1}{8}$-in. in diameter. Only one phase of the motor is connected to the a-c power supply; thus the motor will rotate in the starting di-



Schematic diagram of two positive unidirectional clutches. When shaft is rotating counterclockwise, clutch housing (1) is forced to right engaging stationary clutch (A) and rotating member (B). To reverse rotation, housing is moved to left engaging clutch (C). Automatic disengagement of clutch follows soon after engagement of stationary clutch and the rotating member

A Complete Line of TEFLON STOCK



Sheets
Cylinders
Rods
Tubing
Bars

Immediate Delivery

We supply the Teflon stock you need in *any quantity without delay.* Our selection, the most complete in the country, includes many special items. For example, we furnish unoriented sheet Teflon (starting at $\frac{1}{16}$" thickness) in sizes up to 36 x 36"—the largest sheet Teflon offered anywhere.

Teflon—if you haven't already discovered it—is a unique new DuPont plastic, unequalled for absolute chemical inertness, adhesion resistance and dielectric strength. Teflon cannot be attacked by nor contaminate *any* industrial acid, solvent, caustic, oil, gas, etc. It is extremely tough and suitable for temperatures from —150°F. to 550°F. (can be recommended for higher temperatures in some cases). Teflon is the perfect answer to hundreds of product and equipment problems throughout the processing, chemical and electrical industries.

You'll find Teflon stock is easily machined or cut into whatever parts you need. So whether you're ready for quantity production or merely wish to evaluate, let us know your requirements. We can help you cut costs in many ways.

For complete information on Teflon and on types and dimensions of Teflon stock available, write for Catalog No. 300.

We also manufacture Teflon parts molded exactly to your specifications.

Teflon Products Division

UNITED STATES GASKET COMPANY

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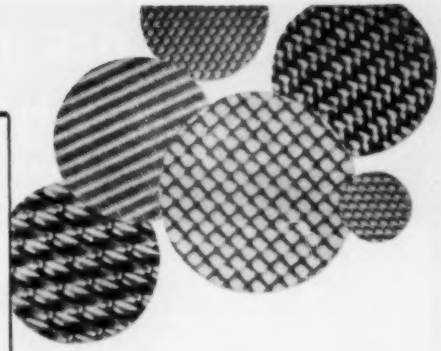
Camden, New Jersey

Compare this *Screen* and *Filter Cloth* with any you are now using!



HOW durable are filters, strainers and screens in the equipment you design?

They won't be sources of trouble if you use wire cloth made of Monel*, Nickel or Inconel*.

These metals are rustless...corrosion-resisting... strong...tough. They endure extremes of temperature. They stand abrasive wear.

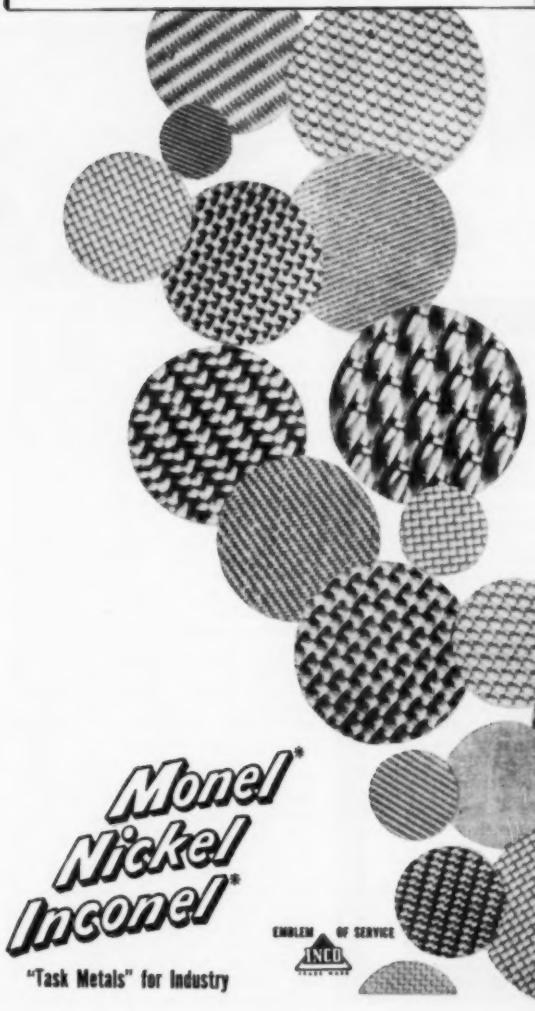
All standard weaves and meshes are available, as well as special construction for "special" jobs. You can specify just the type you need to build long life into your products.

This cloth can be fabricated into any practical shape or size element. Seams are readily joined by brazing, soldering or welding; retain full corrosion resistance.

The price? It's a surprise. Due to excellent working qualities, weavers can produce wire cloth of Monel, Nickel or Inconel at prices comparable to what you are now paying for cloth of less durable metal. *Fine weaves of Monel often cost less!*

Consult any quality weaver. *He'll be glad to quote on the wire cloth you need. For booklet,* **"ESTABLISHED WEAVERS,"** *write to our Frank Bailey.*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y. *Reg. U. S. Pat. Off.



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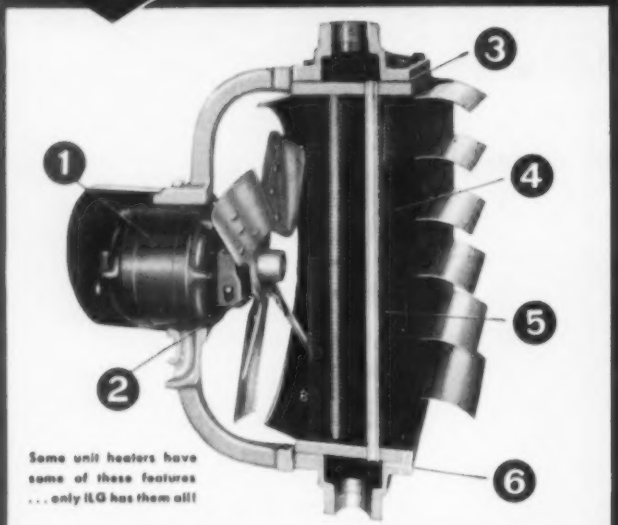
"Task Metals" for Industry

EMBLEM OF SERVICE

THE WORLD'S FINEST UNIT HEATER!

ILG

Extra quiet! Extra capacity! Extra economy!



Some unit heaters have some of these features . . . only ILG has them all!

One-name-plate..Two-piece header..No brazed joints

1. Patented ILG-built Self-Cooled Motor—never "slow roasts" due to radiated heat from core . . . saves 5% to 10% on power cost.
2. Dynamically balanced fan wheel—specifically designed for ILG Unit Heaters . . . verified for dynamic balance at rated speeds.
3. Two-piece header bolted together—graduated for "balanced" steam distribution. Trouble-free operation on steam pressures to 125 lbs.
4. Solid copper core . . . 26 gauge flanged copper fins pressed on to ½" O.D. seamless copper tubes. ILG *never* has substituted less efficient, less durable metals in its fins or tubes.
5. No welded, soldered or brazed joints. Pressing operation *permanently* unites fins and tubes. Brass orifice bushings driven into entrance of tubes to expand tubes uniformly into header.
6. Bottom Header—"Floats" on slotted coil retainer and spring washers —permits expansion and contraction of coil independent of unit casing.

PLUS ILG "One-Name-Plate" Responsibility covering unit and motor.

Use nationally-advertised ILG Unit Heaters because only ILG has all these quality features . . . only ILG offers so much value per dollar.

Send coupon today for FREE Unit Heater Bulletin 342

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rection, either clockwise or counterclockwise.

The motor shaft is rigidly connected to one end of the torsion bar, which is equipped at the other end with two positive unidirectional clutches. One clutch prevents clockwise, and the other counterclockwise, rotation. If the motor is rotating in a clockwise direction and the proper clutch is engaged, the adjacent end of the torsion bar is thereby stopped; this brings the rotor to a stop in approximately 20 degrees. The potential energy stored in the torsion bar is then returned to the rotor in the form of a counterclockwise impulse. The motor attains virtually full speed in the new direction within about two milliseconds. *From Technical Report 1435, National Bureau of Standards, U. S. Dept. of Commerce, Washington 25, D. C.*

Beware of Mr. Pig

As part of the Fairchild campaign for cleanliness, certain departments will soon receive the dubious honor of having Mr. Pig hung on their premises. The dirtiest shops will be awarded the poster, where it will remain until conditions warrant its removal. (From FAD, a publication of Fairchild Aircraft Division, Hagerstown, Md.)

Lime Reclaimed From Water Wastes

THE RAW water supply in Miami, Florida, is fairly hard and highly colored. Without treatment it would be unfit for human consumption. The hardness is due in large part to dissolved bicarbonates of calcium, which are precipitated out, by the addition of lime, in the form of calcium carbonate sludge. Approximately one pound of lime is required for every three pounds of calcium carbonate precipitated.

Over the years since the Miami water treatment plant began functioning, huge quantities of calcium carbonate sludge have been accumulating in an adjacent lagoon. The difficulty of disposing of this sludge, as well as the scarcity of lime during the war years, finally led Miami officials to consider the possibility of reclaiming lime from their own calcium carbonate sludge. The sludge was found to contain remarkably few impurities.

Thus, a lime recovery system was

"Why am I an Orphan?"

...said the small-boiler operator

He was in a pretty tough spot. *Sure*, he wanted to collect his fly ash. But how could he afford a custom-engineered fly ash collector for a boiler under 2000 BHP? He *hated* to think of installing *anything* short of a real fly ash collector!

Could we help? Simple... just tell him about the new Buell 'LR' (Low Resistance) Fly Ash Collector!

SPECIALLY DESIGNED FOR SMALL BOILERS

The cost of the 'LR' Fly Ash Collector fits the smaller plant's budget nicely. Yet the 'LR' is guaranteed to collect 99% of all 100-mesh cinder discharge. And the draft loss is so low you can even use the 'LR' on a *natural draft* boiler!

Practical? The 'LR' is chunky, compact... made to fit a small plant's boiler room. And there's no cleaning, no water, and no maintenance except emptying the hopper!

If you run a coal-fired boiler between 100 and 2000 BHP, write for complete facts on Buell's new 'LR' Fly Ash Collector. Buell Engineering Company, Suite 5030, 70 Pine St., New York 5, N. Y.

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Engineered Efficiency in

Fly Ash Collection

'LR' for small boilers

Here are the "PRINCO" Thermometers for those really TOUGH service conditions. Cases are extra heavy castings, specially designed for maximum strength. Frames and cases are BOLTED together. Glasses are extra heavy plate to withstand shock and vibration. Cases completely sealed against fumes and moisture. Built-in dehydrator prevents fogging or condensation. Extra protection for mercury tubes assures maximum service life.

Available in all standard case angles and temperature ranges, or to your specification. RED READING MERCURY or Canary-backed tubing optional. Wide selection of "Princo" Separable Sockets in a variety of materials. Write for full information and prices. Ask for Bulletin "E".

NEW! PRINCO "Easy-Setting" DIAL THERMOMETERS

5 Standard Scale Ranges
"Easy-Access" Cases for Quick Setting
Simplified Dial and Pointer Adjustment
Rugged, Accurate, Bimetallic Unit

Write for prices and additional information.

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THERMOMETER & INSTRUMENT COMPANY

PRECISION INSTRUMENTS **PRINCO** FOR INDUSTRY

In Canada: PEACOCK BROTHERS Limited
1483 Brandywine Street, Philadelphia 30, Pa.

installed at the City of Miami water plant and has been in operation for more than a year. Key equipment in the process are two thickeners, 32 ft in diameter by 15 ft deep. The sludge is trucked from the lagoon to a wash mill before entering the thickeners. Underflow from the plant clarifiers is also fed directly into the thickeners, instead of to the lagoon, as previously.

The thickeners increase the density of the calcium carbonate slurry to 20 per cent solids. The separated water overflows the thickener tank weirs while the under flow goes to a centrifuge. The centrifuge, in turn, removes additional water to produce 67 per cent solids, which are fed directly into a 6½ ft-diameter by 230 ft-long, rotary kiln. In this kiln, the calcium carbonate is reconverted to lime. The entire system produces approximately 65 tons of lime per 24-hour day. *From Hardinge Highlights, a publication of Hardinge Co., Inc., York, Pa.*

Grouting

(Continued from page 68)

tion. This is especially recommended in cases where live load develops vibrations or impact shocks.

Because grout at the time of application is a plastic filler used to fill all spaces and cavities between a machine or sole plate and the foundation upon which the equipment operates, it should be given sufficient time to solidify so that it will be able to support the full static load without deformation of any kind. It is a good practical rule to permit the principal foundation to set for a period of 28 days before totally loading. The setting and shrinking process of the mass is very slow and continues for many years.

Correction for "Electrical Modernization"

WILBUR J. FLEIG, author of the article "Electrical Modernization Calls for Ingenuity," has taken us to task for some rather remarkable errors which appeared in the published version.

Of course, the "12 ft by 12 ft timbers" in the caption for Fig. 3 should have been "12 in. by 12 in. timbers." Not so apparent is the error in the statement: ". . . the trip from street level to the 15th floor took approximately 3 minutes." It actually took 3 minutes to the 14th floor and another half-hour from there to the 15th floor.

Good ventilation was *one* of the reasons for locating the transformers on the 15th floor but it was not the most important as stated in the caption for Fig. 1. And, furthermore, the conversion of the system was from d-c to a-c.

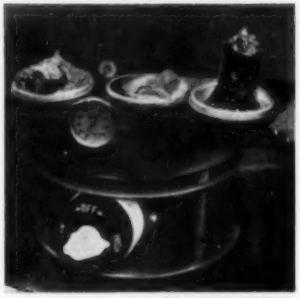
It isn't always the heat. Sometimes it's the stupidity.

"SUCCESSOR TO GREASE" NEVER MELTS

MULTI-PURPOSE LUBRICANT

Plastilube called most important lubrication development in 20 years.

PLASTILUBE, the remarkable new multi-purpose, non-melting lubricant is today solving high-temperature and other lubrication problems for many of America's largest industrial and automotive users. In five short months, over 1000 concerns have tested and now specify this new product of The Warren Refining & Chemical Company, Cleveland.



One reason for PLASTILUBE'S sensational acceptance is the fact that it will not melt. The picture shows equal quantities of barium grease (left), lithium grease (center) and PLASTILUBE on a hot plate with a temperature reading of 345 deg. F. Note that the barium and lithium are melting rapidly while PLASTILUBE is unaffected.

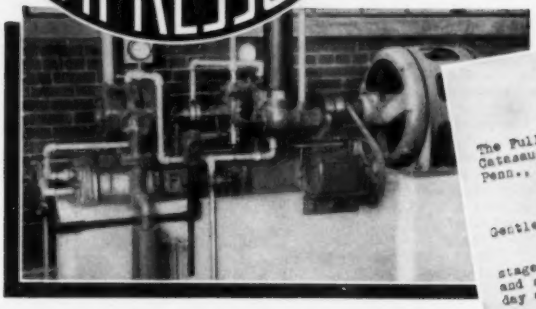
In addition to the non-melting feature, PLASTILUBE possesses greater adhesion, excellent pumpability at low temperature, is exceptionally resistant to the washing action of water, and will not break down during working—allowing longer service life and consequent economy in use.

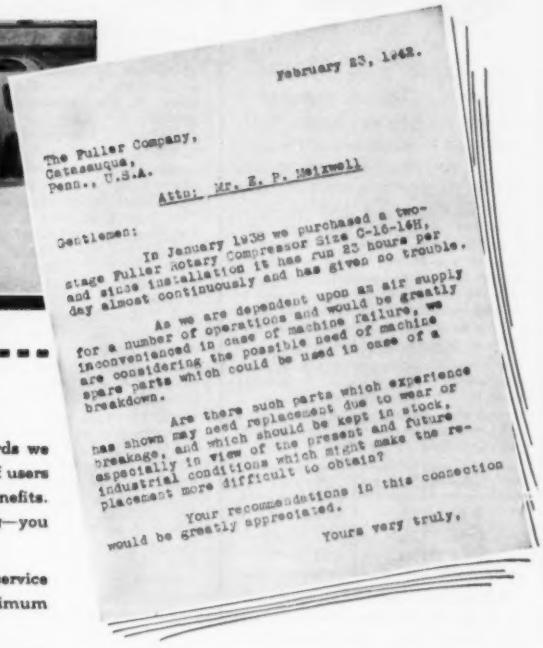
PLASTILUBE, "the successor to grease" is made by a radically new process combining Warren's I-45 and BENTONE (a product of National Lead Company). There is no comparable product on the market. It is rapidly being recognized as the most noteworthy development in lubrication since the first use of additives in motor oil twenty years ago.

For further information, samples, etc., write The Warren Refining & Chemical Co., Dept. PE-2, Cleveland 15, Ohio. *(Advt).*

FULLER ROTARY COMPRESSORS

For Heavy Duty 100-125-Lb. Pressure





February 23, 1942.

The Fuller Company,
Catasauqua,
Penn., U.S.A.

Attn: Mr. E. P. Meixwell

Gentlemen:

In January 1938 we purchased a two-stage Fuller Rotary Compressor Size C-16-16H, and since installation it has run 23 hours per day almost continuously and has given no trouble.

As we are dependent upon an air supply for a number of operations and would be greatly inconvenienced in case of machine failure, we are considering the possible need of machine spare parts which could be used in case of a breakdown.

Are there such parts which experience has shown may need replacement due to wear or breakage, and which should be kept in stock, especially in view of the present and future industrial conditions which might make the replacement more difficult to obtain?

Your recommendations in this connection would be greatly appreciated.

Yours very truly,

We built 'em good in 1938---and we're still doing it.

Here's a letter that tells a story better than any words we could use. Nor is it an exceptional case . . . hundreds of users of Fuller Rotary Compressors are reaping the same benefits. It further strengthens the claims we have been making—you too can profit by installing Fuller Rotaries.

There's every logical reason for long continuous service with these units. Simple, sturdy construction, a minimum of moving parts—rotor, bearings, blades.

Shut-downs are costly . . . lost time can never be recovered . . . it's up to you to see that the very best equipment is installed in your plant.

The next time you are in the market for compressors or vacuum pumps get in touch with us.

No. 4 of a series

FULLER COMPANY
CATASAUQUA—PENNSYLVANIA
Chicago 3 - 120 So. LaSalle St.
San Francisco 4 - 420 Chancery Bldg.

Bulletin C-5 illustrates and describes these machines. Send for your copy now.

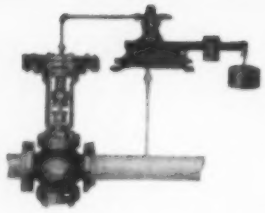
A LIFETIME OF NEW MACHINE EFFICIENCY

C-194

ATLAS

Super-Sensitive

PRESSURE REGULATORS



You will like these remarkable regulators. They are particularly adapted to service where pressures must be maintained within fractions of one pound and without perceptible variation even where demands fluctuate and widely varying initial pressures occur. They are suitable for steam, air or gas where it is essential to maintain a constant reduced pressure in heating mains, vats, cookers, retorts, etc. They are also used as altitude regulators to maintain constant level in open tanks, or as a pump governor to assure constant pump discharge pressure.

The scope of application of this ATLAS Regulator is almost unlimited in pressure regulation. It will accurately regulate at any pressure between the initial pressure and atmosphere in one stage, operating control valves from ½" to 6".

For Reduced Pressures	*Specify*
2 to 15 lb.	ATLAS 801
0 to 5 lb.	ATLAS 801-8
15 to 150 lb.	ATLAS 802

Ask for Bulletin No. 1 B which tells all about ATLAS Super-Sensitive Pressure Regulators. Use the coupon below, at the same time checking for information on other ATLAS products.

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REGULATING VALVES FOR EVERY SERVICE

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NEW BOOKS

for the plant engineering staff

Handbook of Information

KENT'S MECHANICAL ENGINEERS' HANDBOOK, in two volumes. Volume I, Design and Production, edited by Colin Carmichael; Volume II, Power, edited by J. K. Salisbury. Twelfth edition, size 6 by 8¼ in.; approximately 3000 pp; flexible Fabricoid. Published by John Wiley & Sons, Inc. Price $8.50 per volume.

KENT'S HANDBOOK is so well known that to the older generation of engineers at least, this announcement of the new twelfth edition scarcely needs more than mention. For over 50 years this handbook has been the classic in its field; it has become the standard handbook of the mechanical engineering profession.

Volume I, Design and Production, is directed primarily towards the engineers who design and manufacture machinery, appliances, mechanical equipment and other engineered products. The 28 sections into which this volume has been arranged may be classified broadly as: Selection of materials; Design principles; Design and selection of machinery components; Production processes; Production plant equipment; and Mathematical tables.

Volume II, Power, is devoted to atomic power, combustion gas turbines, supersonics, marine engineering, jet propulsion, aircraft piston engines, heat pumps, panel heating, diesel locomotives, electric locomotives, axial flow compressors and instrumentation.

Retaining the handy size and flexible binding of the previous edition, the new handbook has been completely rewritten in clear and accurate language. This new twelfth edition is completely different from the previous edition. Although much of the material from the 11th edition has been condensed, both volumes are now larger than their predecessors due to the necessity of presenting recent data and latest practices.

A new index, carefully worked out by the editors, makes each piece of information doubly accessible. In the Kent tradition, the new edition stresses practice rather than theory.

The quantity of physical and mental engineering effort that is represented by the information contained between the covers of these two volumes is beyond comprehension; it involves untold thousands of man hours. Without question, these two volumes should be on the shelf of every engineer's library.

Engineered Selling

SALES ENGINEERING by Bernard Lester. Size 5½ by 8½ in.; 226 pp; second edition; cloth bound. Published by John Wiley & Sons, Inc. Price $3.00.

THE CHIEF purpose of this book is twofold. First, to inform the younger technically trained or engineering graduate of the character of work done by the sales engineer and the opportunities that exist for his services. Second, to help the large army of technical men engaged either in selling or supervising distribution and sales, by raising

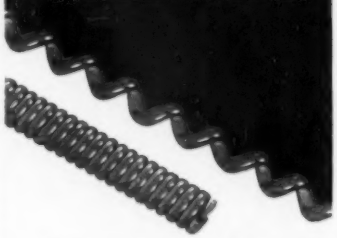
THEY'RE SAFER

THEY'RE NEATER

THEY LAST LONGER

THEY'RE

Koiled Kords



Koiled Kords extend to five times their retracted length. They eliminate hazards by always being out of the way so that tripping and tangling are eliminated. Buy them in mandrel lengths and use them for replacement on power tools or anything electrical that moves. Available in standard lengths of neoprene-jacketed power kord, or made to meet your specifications.

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Neoprene - Jacketed Straight Cord

DYNAPRENE Flexible Cord is ideal where the unique qualities of Koiled Kords are not required. DYNAPRENE is a special neoprene compound developed to provide longer life and better service under tough conditions.

Be sure to specify Whitney Blake type SO or SJO for flexible cord requirements.

Write for descriptive DYNAPRENE bulletin.

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Life-Line SAVES

On your conveyors

The experience of this Philadelphia plant might well be yours. Maintenance costs of motors were moderate. Nevertheless, the plant operators were continually on the lookout for ways to cut costs. Sound familiar?

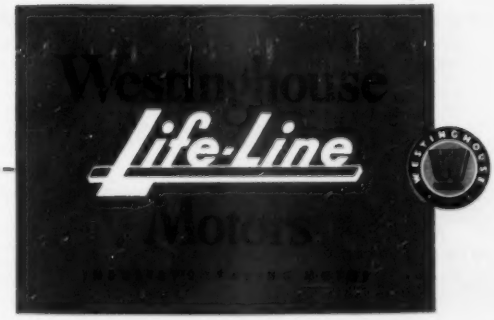
They found it in Life-Line motors. As they put it, "Life-Lines save the expense of constant lubrication. Formerly, it was necessary to have a special oiler do nothing but lubricate motors. Now, all this is eliminated. Life-Lines need no lubrication."

Unusual? No. Typical on Life-Line installations. Users all over the country say, "Life-Line motors save me money". An industry average indicates a yearly saving of $2.70 per motor from lubrication alone.

Think what it costs to lubricate motors on your conveyors and other equipment. That's money you can save . . . money you can deduct from your operating expense account.

Isn't this saving worth getting? You get it with Life-Lines at no extra cost. Ask your Westinghouse representative for a copy of Motor Costs, B-4321, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-21584

If you figure LIFE-COSTS . . you'll figure LIFE-LINE



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DISCHARGE CAPACITY

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their sights and improving their skill.

Besides these two groups to whom this book is primarily directed, there are many executives or engineers engaged in design, production, or counselling who will benefit by obtaining a clear picture of distribution and selling, because they, too, serve markets and customers.

The author not only covers the actual sales methods, he also examines the sales engineer himself—his product, his market, and his training. Each important point is backed up with an illustrative anecdote from his own experience. These stories help to demonstrate the practical usefulness of the suggestions, and they make the ideas stick in the reader's mind long after a mere list of suggestions would have been forgotten.

The Little Giants of MH

HANDBOOK OF MATERIAL HANDLING with Industrial Trucks. Size 8½ by 11 in.; 72 pp; illustrated; paper bound. Published by Electrical Industrial Truck Association. Price $1.00. (NOTE: Executive officials of any industry, making application on company letterhead to The Electrical Industrial Truck Association, Department PR, 3701 N. Broad St., Philadelphia 40, Pa., will be supplied a complimentary copy of the handbook).

THIS HANDBOOK, entirely new in text, illustrations, charts, diagrams and comprehensive engineering data is a practical guide for the analysis of material handling operations and the application of the unit load methods.

Divided into four sections, this book covers: 1, The evaluation of industrial truck handling; 2, material handling management, with sub-sections devoted to the preparation and use of flow process charts, handling operations in production, handling in storage, the use of unit loads in storage, with layouts, commodity and capacity factors; 3, the organization of an industrial truck system; and 4, practical truck engineering.

Sections of the book describe the different types of industrial trucks in use; their integration of operation with other material handling systems, unit load determinations and patterns, how to charge and to change storage batteries, how to keep battery records; how to measure handling costs; routing and dispatching methods, and how to train industrial truck operators.

Design of Steam Turbines

STEAM TURBINES AND THEIR CYCLES by J. K. Salisbury. Size 6 by 9 in.; 615 pp, including index and appendix; cloth bound. Published by John Wiley & Sons, Inc. Price $9.00.

HERE IS a book on steam turbines which presents in thoroughly digestible terms, devoid of unnecessary abstract theory, the essentials of steam design of turbines.

This book will be welcomed by engineers because it presents design and performance data which have hitherto been unpublished and not generally available. The book includes both "basic principles," and the most advanced thinking on new methods of analysis in this field. Extensive use has been made of actual examples taken from practice.

The material is handled in four parts:

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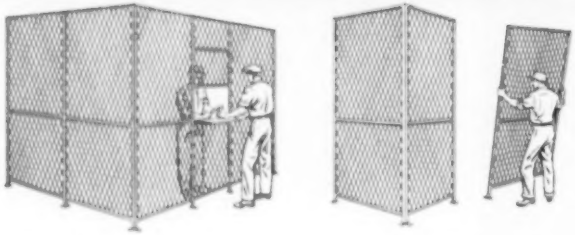

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Acorn Wire Mesh Partitions, by enclosing tool cribs and stock rooms, prevent tool and parts pilfering, give tight control of tools, material and personnel in these areas. Divide large open spaces into efficient, separate departments, cut down confusion. Cost much less than solid walls, permit passage of light, air, sound and heat.

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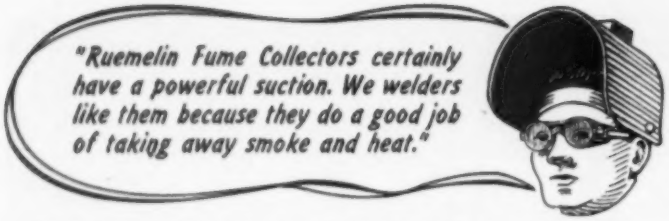
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Welding shops equipped with Ruemelin Fume Collectors enjoy a clean working atmosphere. Smoke, heat and gas are removed quickly and efficiently. Working conditions greatly improved . . . production increased. For the large welding booth, a long reach model (shown below) makes it easy to reach any welding job. 15 ft. and 18 ft. sizes. Available in wall type or underslung ceiling type brackets.

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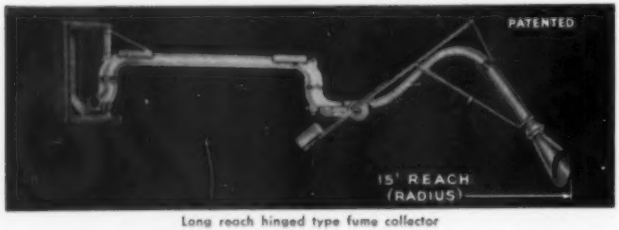

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Part 1, Fundamentals of Turbine Design, deals with thermodynamics, powerplant cycles, flow of fluids, turbines—general, turbine external characteristics, stage efficiency, design of a turbine stage, and steam-path design. Part 2, The Regenerative Cycle, tells of regeneration and non-extraction performance, modern heat-balance practice, conventional heat balance, short-cut to turbine-cycle heat rate and additional heat-balance data. Part 3, Cycle Analysis, discusses heater-cycle losses, single-heater formulas, distribution loss, evaporation of makeup, etc. Part 4, Application Engineering, explains design details, and how to estimate steam and heat rates.

Mean, Median and Mode

QUALITY CONTROL and Statistical Methods by Edward M. Schrock. Size 6 by 9 in.; 250 pp; tables and charts; cloth bound. Published by Reinhold Publishing Corp. Price $5.00.

IN CLEAR, straight-forward language this book takes you step-by-step through the operations of applying statistical methods to the problems of modern industrial quality control.

The application of methods covers the broad field of industry and includes such diverse problems as are found in the electrical industry, growing and packaging of foods, steel products, errors in filing, mail orders, clothing, lumber, controlling overtime, optical instruments, biologicals, textiles, and polls of public opinion.

If your plant is beset with problems of product quality, you will find real help in this book, not only because it explains the many ways of appraising and controlling quality, but because it will enable you to apply the most modern methods to your specific needs. Proper understanding and application of this knowledge will go a long way towards increased production and lowered costs.

Lubrication Know-How

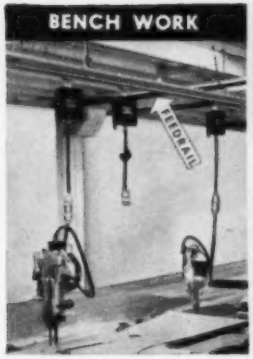
MOTOR OILS AND ENGINE LUBRICATION by Carl W. Georgi. Size 6 by 9 in.; 515 pp; illustrated; cloth bound. Published by Reinhold Publishing Corp. Price $8.50.

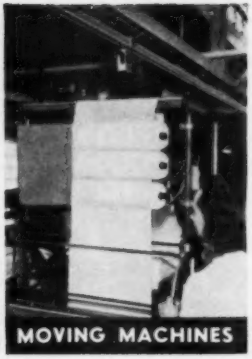
THE PRACTICAL problems of engine usage, maintenance and lubrication, as well as causes and remedies affecting operating troubles, are described in this comprehensive book.

It covers the methods of testing and evaluating performance characteristics of motor oils. Particular emphasis is laid upon viscosity index and its importance in all phases of motor lubrication.

An unusual feature of the book is the inclusion of detailed specifications covering various types of engine tests, properties of lubricants (ash, carbon residue, pour point, color, corrosion, flash point, etc.) and all types of performance ratings. Also included are chapters devoted to the refining and manufacture of motor oils and descriptions of their chemical and physical properties.

Later sections of the book deal with the application of motor oils and the relation of oils and lubrication to engine design, operation, maintenance, breakdowns and failures. Valuable information is given to aid in diagnosing





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Feedrail is also ideal for cranes and hoists, moving test lines and lighting. In fact, anywhere electrical equipment moves. You can save wiring costs, maintenance time, speed up your plant, and make it electrically safe at the same time.

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engine ailments, and in adopting corrective steps necessary to prevent their recurrence.

Operating Principles of Electric Instruments

MANUAL OF ELECTRIC INSTRUMENTS (GET-1087A), Construction and Operating Principles. Size 8½ by 11 in.; 140 pp including glossary and index; cloth bound. Published by Meter & Instrument Divisions of General Electric. Copy can be obtained from Distribution Section, Advertising & Sales Promotion Div., General Electric Co., Schenectady 5, N. Y. Price $1.00.

THIS NEW and revised edition describes the fundamentals of construction and operating principles of all major types of electric instruments.

Prepared primarily for use in schools, the manual also is designed for men in industry who wish to gain familiarity with the electric instruments with which they work.

The manual's purpose is to contribute to the more effective use of electric instruments by explaining their operating principles and by illustrating the application of these principles in the instruments commonly used for electrical measurement. Structural features are described in whatever detail is necessary for an understanding of their functions.

The thirteen chapters explain the fundamentals of such instruments as thermocouples, synchroscopes, frequency meters, and electric telemeters. Photographs and diagrams are used extensively to help illustrate the various instruments, their operations and applications.

Methods of Instrument Measuring

INDUSTRIAL INSTRUMENTATION by Donald P. Eckman. Size 5½ by 8½ in.; 396 pp; illustrated; cloth bound. Published by John Wiley & Sons, Inc. Price $5.00.

THIS BOOK can be of great value to all engineers dealing with plant measurement and control. It reviews the principles of measurement methods employed in industrial processing and manufacturing.

It also shows how to apply instruments to processes—process analysis; selecting and arranging instruments and controllers; supervising instrument equipment. Composition analysis methods are covered, emission and absorption spectroscopic analysis, mass spectrographic analysis and others. Mechanical measurement instruments are discussed on displacement gages, strain gages, force meters, velocimeters, and accelerometers.

Furthering the analytical (rather than empirical) approach, the author reviews such principles of mechanics, thermodynamics, and electricity as apply directly to problems of measurement. After the fundamentals have been mastered, the engineer is equipped to extend measurements far beyond elementary concepts of temperature and pressure determination.

Welding Know-How

WELDING METALLURGY, IRON AND STEEL, by O. H. Henry and G. E. Claussen, revised by G. E. Linnert, Second Edition; 5¼ by 7¾ in.; 505 pages; cloth; published by The American Welding Society, 33 W. 39th St., New York, N. Y. Price $2.50.

THE SECOND EDITION of this book involves extensive rearrangement of the material in Henry and Claussen's original publication. During the past eight years since this book was first published, great strides have been made in the art of welding, particularly in connection with the war effort. During this critical period all of the American Welding Society's efforts—research, design, production—were carried on at an abnormally accelerated pace. It is for this reason that a revision of this book at this time is extremely important. Much of our late progress in welding can be attributed to our increasing knowledge of the metallurgy of welding. It would be sheer folly to weld alloys like the high-strength heat-resisting steels or the age-hardening aluminum alloys if their metallurgical characteristics were not known.

In general pattern, the second edition remains unchanged. In its preparation the information which has been garnered on welding metals during the intervening years has been sifted and that which rightfully belongs in a text on this subject has been included as new material.

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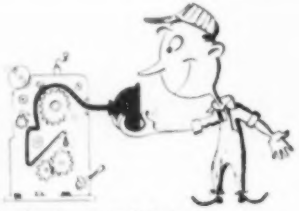

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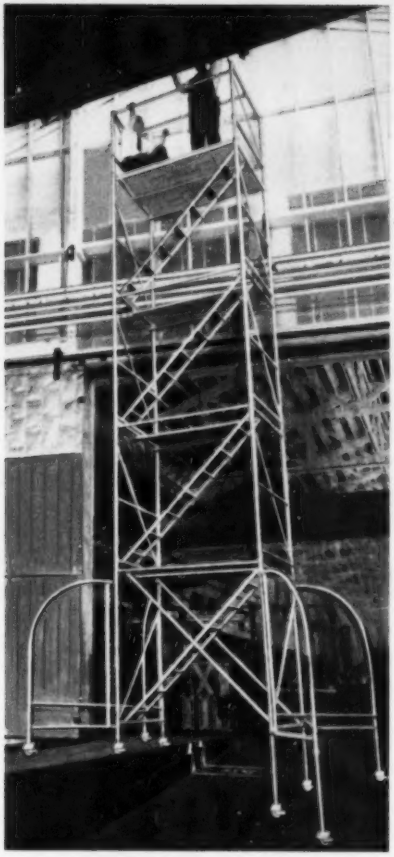

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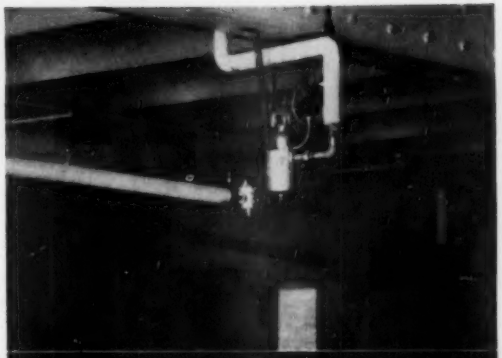

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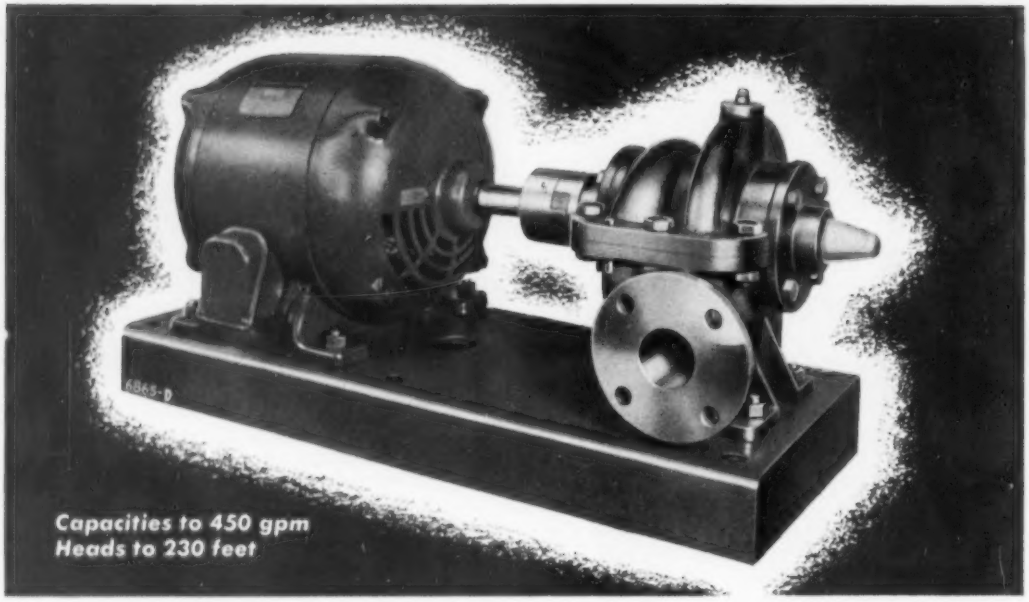

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(Continued from page 20)

electric sets of several types are cataloged in 36-pp Form 12597-D051, fully illustrated in color. Includes several new models recently added to company's line. Provides specifications for all equipment. Caterpillar Tractor Co.

142 Door Operator—Form 2178 describes electric operators for sliding doors and gates, and swinging gates, explaining how they work and illustrating some installations. Also discusses conventional switch control and radio control which may be incorporated. Barber-Colman Co.

143 Hydraulic Lift Gate—A time- and labor-saving lift gate attachment for ½ and ¾ t "pick-up" trucks is described in this bulletin. Gate, which is operated by two hydraulic hoist cylinders, serves as a lightweight freight elevator; makes it possible for driver alone to lift or lower loads up to 800 lb from curb or ground level. Anthony Co.

144 Electric Tiering Truck—Bulletin 701 introduces company's new lightweight, short-sized Spacemaker built to tier 48 by 40 in. loads at right angles from a 6 ft aisle. Photos showing performance of this riding truck in limited space are accompanied by text covering its uses. Specifications included. Lyon-Raymond Corp.

145 Hand Truck with Possibilities—A lightweight, two-wheel hand truck especially designed to handle the widest possible variety of materials is described and illustrated in Form 757. Photos show the truck loaded with metal drums, sacks of potatoes, cases of bottled goods, rolls of fencing. Specifications, prices included. Standard Pressed Steel Co.

146 Efficient Bridging—Here's a bulletin on industrial bridge ramps — a lighter weight magnesium type for 3000 to 10,000 lb loads and a heavy-duty steel ramp for loads to 15,000 lb. Includes sizes, shipping weights; tells how to measure for ramps. Penco Engineering Co.

147 Bin Discharger — Bulletin 250 describes a circular bin discharger designed for handling pulverized, granular, glutinous and soft lump materials that may puck or arch and refuse to discharge by gravity, or may aerate and surge through openings too rapidly. Discusses and illustrates a unit with flight fingers above the bin bottom and one with flights above and below the bin bottom. Stephens-Adamson Mfg. Co.

MAINTENANCE

148 Rope Reference Chart—This handy wall chart, 17 by 22 in., gives specifications on manila, nylon and sisal ropes. Diameters, circumferences, approximate net weight of 100 ft, approximate gross weight of full coils, breaking and working strengths, are included for sizes from ¼ to 3½ in. dia. Also explains company's dispensing carton and pre-measured marking feature. New Bedford Cordage Co.

149 Repairing with Cements—Bulletin C-8 explains use of corrosion resisting cements to repair cracked, corroded and broken pipe, pumps, valves and other mechanical equipment in corrosive service —equipment made of metal, hard rubber, glass, porcelain, carbon, stoneware, wood or plastic. The synthetic resin cements covered are described as resistant to many acids, solvents and alkalis up to 325 F. Carboline Co.

150 Easily Handled Scaffolds—The advantages of aluminum's light weight as a time and labor saver in assembling, disassembling, storage and transportation are shown in Bulletin PSS-20 on sectional ladder scaffolds. Also discusses their safety features, including rigid joint construction provided by slipping the upper frame over a sprocket in the lower section and securing it with a hinged pin. Complete specifications included. The Patent Scaffolding Co., Inc.

151 For Cleaner Brush-Ups—Here's a folder describing company's Cloclamp, a new push broom accessory. This clamp fits on the handle and holds a dampened cloth over the brush area. Use of cloth promotes cleaner floor sweeping, bulletin points out, and clamp permits easy adjustment of cloth by sweeper—so soiled portion is pulled out of the way and clean section pulled into place as needed. Walter G. Legge Co., Inc.

152 Coatings to Outlaw Rust—Form 249 is a 16-pp catalog on rust preventives—long and short oil types, coatings, heat resistant and chemical resistant coatings, floor coatings and machinery and implement finishes. Gives directions on how to prepare surfaces and apply coatings, coverages, drying times. Special properties of each product are discussed and more than 70 color chips are provided to show actual shades available in coatings and finishes. Rust-Oleum Corp.

PLASTICS, CHEMICALS

153 The Possibilities of Teflon—This is a 12-pp booklet on the applications and properties of Teflon—tetrafluoroethylene resin. Discusses design considerations pertaining to its use in gaskets and packings of many types, which by virtue of their chemical inertness, toughness, and excellent electrical properties, are especially suited to applications in the chemical industry. Polychemicals Dept., E. I. du Pont de Nemours & Co.

154 How to Store Bulk Plasticizers — Technical Bulletin 0-69, 16 pp, covers facilities for plasticizers bought in bulk tank car quantities. Includes drawings of typical equipment types and arrangements, details of piping, heating coils, tanks, steam tracer lines, also viscosity curves and properties for a number of chemicals. Organic Chemicals Div., Monsanto Chemical Co.

155 Pocket Manual on Chemicals—Form A-950 is a recently revised ordering guide covering company's caustics, sodas, cleaners and other industrial chemicals. Thumb-indexed, this handy little booklet gives typical uses of the chemicals, tells available grades and shipping procedures. Columbia Chemical Div., Pittsburgh Plate Glass Co.

156 Charts on Plastics—Technical Bulletins C-O-137 and C-O-105, two single-page charts, list the physical and chemical properties of six polystyrenes and 17 rigid plastics. In addition to physical properties the sheets have data on dielectric strength, power factor, light transmission, heat conductivity, burning rate, dust explosion hazards. Chemical Div., Koppers Co., Inc.

157 The Why of "Dry" Water—This bulletin on company's blue Dri-Water concentrate for rinsing metals and other materials, explains its use with infra-red ovens, painting set-ups; discusses some applications. Gives prices, coverage. The Mikella Infra-Red Co.

158 For Metal Inspection—This folder provides step-by-step instructions on a dye penetrant method of locating cracks and porosity in metal surfaces and discusses use of company's formulations utilized—surface cleaner, dye penetrant and mark developer. Tells where and when to use them and how to interpret results. Includes prices on large and small quantities. Dy-Chek Co.

VENTILATING, AIR CONDITIONING

159 For Difficult Ventilating—A flexible air duct that is easily installed, durable and economical, is the subject of Form 567. Explains how this duct offers a solution to many exhaust and ventilating problems involving removal of fumes, dust, grindings and lint, and machine applications where permanent duct work isn't suitable. Illustrates some installations, pictures standard and special types and gives sizes. The Wiremold Co.

160 Packaged Ventilating Units—Bulletin DS-948U describes and illustrates utility fans for outdoor or indoor installation. Discusses their applications and construction. Includes capacity and dimensional data for belt drive and direct drive units. The Trane Co.

161 Thrifty Air Conditioning—Bulletin 118 tells how one plant learned about the savings possible with the installation of an activated carbon air recovery system. Describes and illustrates equipment used and explains how it functions to remove impurities and make stale air fresh. Also discusses absorbing properties of activated carbon. W. B. Connor Engineering Corp.

WATER CONDITIONING

162 Ion Exchange Systems—"Amberlite Monobed Deonization" is a 12-pp miniature textbook covering the history, behavior, present performance, and potential uses of the Monobed ion exchange systems in water-conditioning, chemical processing and other industries. Reactions of various combinations of exchangers are explained in text and equations. Also discussed are operating costs, equipment costs, quality of product derived, rinse requirements and other properties as they apply to the complete or partial single-step removal of ionized solids from solution. Design and operation of Monobed equipment is described and more than 80 fields of application listed. A table gives nomenclature, chemical behavior and typical uses of six different systems. The Resinous Products Div., Rohm & Haas Co.

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163 **Zeolite Softeners for the Small Plant** — Publication 4505 describes company's junior industrial type zeolite softening equipment for economical use by plants where relatively small quantities—less than 100 gpm—of softened water are required. Gives dimensions, capacity data, specifications for both single and double units; exchange materials. Cochrane Corp.

ASH HANDLING

164 **Automatic Ash Removal**—This 36-pp booklet presents company's pneumatic soot and ash removal systems for handling all furnace refuse from fine dust to cinders and side wall clinkers, and applicable to stoker or powdered coal installations. Discusses low power and labor costs, low maintenance, flexibility and other major advantages of the system. Describes and illustrates control unit, vacuum producing unit, ash receiver sections and other parts. Illustrates installations in manufacturing and power plants. Chicago Fire Brick Co.

165 **Fly Ash Precipitation**—This bulletin describes an electrostatic precipitator for removal of either bituminous or anthracite fly ash from power plant gases. Illustrates an installation, also packaged power units. Explains how equipment works and discusses its advantages. Koppers-Hiex Precipitator Dept., Koppers Co., Inc.

HEATING, PIPING AND ACCESSORIES

166 **How to Choose and Use Air Traps**—Bulletin 202, 4 pp, describes manufacturer's complete line of air traps, covering their selection and installation for automatic drainage of moisture from compressed air intercoolers, aftercoolers, receivers, separators, and drip points. Illustrations of the various airtrap models, their applications and how they work are presented; also physical data and list prices. Armstrong Machine Works.

167 **Strainers and Separators**—Bulletin R-46-50A is a revised 16-pp catalog covering manufacturer's Y and T-type strainers, suction strainers, multi-flow and receiver separators. Contains descriptions, dimensions, weights and list prices. Shows how several types have been redesigned for increased efficiency. Includes technical data, also engineering information on flange dimensions and service pressure ratings. American District Steam Co.

168 **Plastic Pipe and Where to Use It**—This bulletin describes six types of plastic pipe, including a tubing for chemical processing and a well casing. Gives brief but helpful application information on each type and includes dimensions, other data. Carter Products Corp.

169 **Pinch Valve Data**—Illustrated Bulletin 455, 16 pp, gives complete information on company's line of natural and synthetic rubber pinch-type valves. Although designed primarily to handle highly abrasive solids in suspension or corrosive fluids, these valves are also adapted to handling gases, vapors, semi-solids and air floated dry material. Bulletin covers slip-on, flanged end, and diaphragm motor types. Includes charts, photos and schematic drawings. Discusses operation, applications; gives dimensions, selection data. Flexible Valve Corp.

170 **Heat Exchangers**—Bulletin 11.0.080 describes and illustrates company's air cooled heat exchangers for condensing or cooling of steam or process vapors, natural gas, jacket water, lubricating oil, quenching baths. Discusses design, flexibility, simplicity, and other advantages of the exchangers. Includes specifications. Equipment Div., J. F. Pritchard & Co.

171 **Electrically Operated Trap**—Bulletin ET describes company's Electrap for pumping or lifting service or for draining vacuum lines. Explains operation and provides drawings of typical installations. Also tells how this trap is being used to return condensate from high pressure processing equipment back to boiler room at higher temperatures, and how it eliminates heat losses that come with flashing or the addition of cooling water. The Johnson Corp.

172 **Cutting Water Heating Costs** — Bulletin WH-12 presents an analysis of comparative costs of water heating methods. Catalogs and stresses features of company's compact instantaneous steam injection heater and includes a cost-check table. Cites savings up to ½ and more in fuel, installation and maintenance costs; also instant availability of any volume of hot water, automatic adjustment, space saving and a noise elimination feature. Specifications of seven sizes are given for both direct and accumulator applications. Heater Div., Pick Mfg. Co.

173 **What's In a Valve?**—Vol. 10, No. 33 of Valve Values, company's house organ, tells of new testing techniques in valve design. Also describes and illustrates laboratory devoted to steel research. Includes a handy table showing pressure-temperature ratings for steel valves, pipe flanges and flanged fittings—a table just the right size to file or put under the glass on your desk. Edward Valves, Inc.

174 **Flexible Metal Hose Catalog**—Metal hose, tubing, high-pressure flexible hose, couplings and diesel engine exhaust hose are presented in Catalog U-101, 12 pp. Illustrated with photos showing locking design details, gives applications, specifications, sizes. Universal Metal Hose Co.

OTHER EQUIPMENT

175 **Fundamentals of Electronic Calculation**—What a plant engineer should know about high speed automatic calculating and how it can serve his purposes are discussed in this informative 22-pp booklet. It touches upon some of the advantages of technical calculating and gives a partial list of problems which can be solved by calculation. It also includes a detailed study on pile driving impact to show how an economical mathematical analysis of the characteristics of a given physical situation can replace trial-and-error procedures. International Business Machines Corp.

176 **Double-Hung Refractory Arch**—The special advantages of company's pendulum-hung principle of supporting arches, now incorporated in a refractory hung insulated arch, are discussed in this single-sheet bulletin. Illustrates this design which permits freedom of movement without disengaging lower tiles and reduces mechanical spalling of refractories. George P. Reintjes Co.

177 **What Steam Jet Syphons Can Do**—Steam jet syphons which operate on the jet principle utilizing energy of steam under pressure to pump, heat, mix liquids and handle solids are described and illustrated in color in Bulletin 2-A, 24 pp. In three sections, the first details the design, application, construction and operation of available types, with text supplemented by photos and drawings showing the operation and working parts. Sizes, dimensions, prices and capacities are presented in tabular form. Special purpose and corrosion resistant syphons are covered in Section 2. Typical applications of steam jet syphons in pumping, heating and mixing are included in Section 3, of special interest to plant engineers. Schutte and Koerting Co.

178 **Flush Pedal**—A pedal attachment which quickly converts hand-operated flush action on toilets to foot-pedal flush, without plumbing changes or shutting off water supply is introduced in this illustrated folder. Stresses economy, quick installation, ease of use and sanitary advantages of the attachment for use in industrial plants, public buildings. Approved Products Co.

179 **Stainless with a Copper Core**—This 16-pp pocket-size bulletin describes Rosslyn, a cladmetal made by permanently bonding copper between two sheets of stainless steel to give properties of both. Illustrates and describes this process and lists some of the metal's uses. American Cladmetals Co.

180 **Combination Firing**—The lower fuel costs afforded by combination firing are stressed in Bulletin ID-49-42 on company's packaged steam generators designed for firing with natural, manufactured or mixed gas or No. 3 fuel oil; for low or high pressure steam or hot water. Gives capacities, dimensions for these automatic units of 15 to 100 hp. York-Shipley, Inc.

181 **For Quick Oil Flushing**—This single-sheet bulletin describes a new portable oil flusher for machinery cleaning jobs. Illustrates flusher, stresses time and labor savings afforded by its use. Fox River Tool Co., Inc.

182 **Economical Distillation** — Manufacturer's Paracoil evaporators and their conversion to modern low pressure vacuum type distillation plants is described in illustrated Bulletin 40A, which includes photos and cycle diagrams of both single and double effect plants, also performance data. Tells how existing evaporators may be rearranged and supplemented to secure additional benefits and economical operation. Davis Engineering Corp.

183 **Improved Dry Mixing**—Catalog Section 401 illustrates and explains construction and operation of company's twin shell blender for mixing dry solids—a blender which involves combined tumbling or rolling action with a simultaneous transverse movement within entire mass of material. Includes blending test data, capacities, sizes. Patterson-Kelley Co., Inc.

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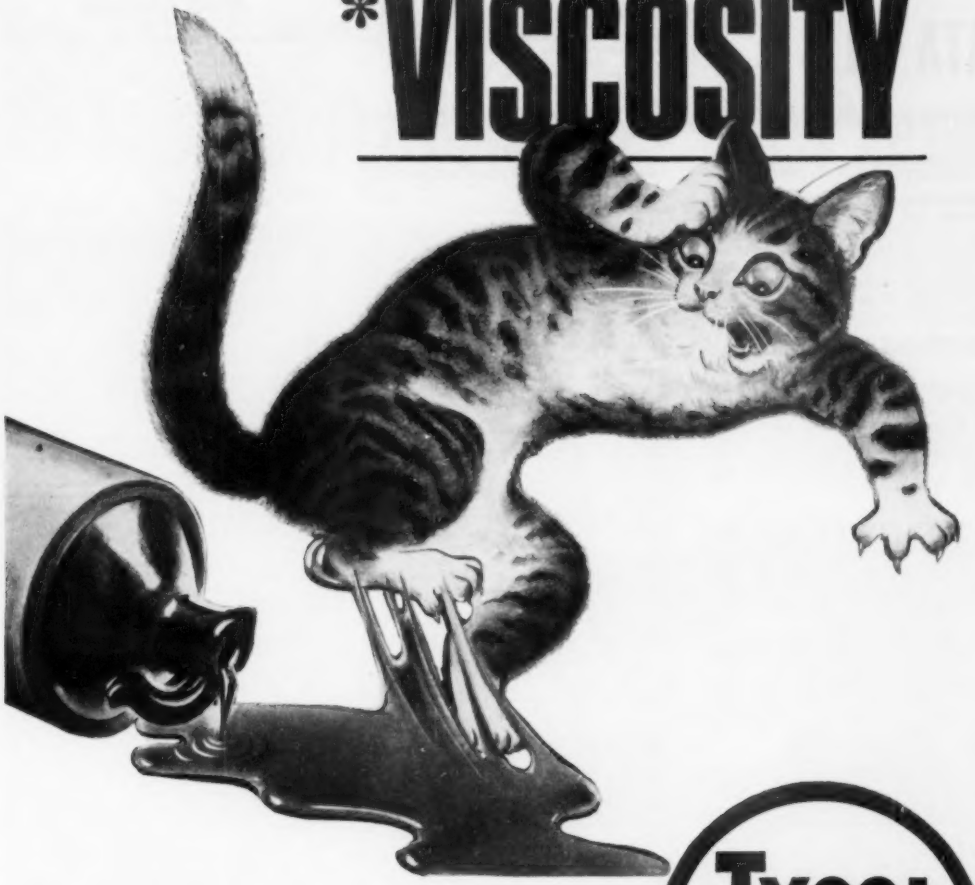

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DATA FILE

of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to aid plant engineers in maintaining a permanent, up-to-date data file. For copies of these, write the number preceding the desired bulletin on the card in the heavy insert, pages 19 and 20 and 77 and 78.

MATERIALS HANDLING

201 Improved Overhead Handling—In Bulletin C-1, 56 pp, are more than 100 photos of overhead handling equipment in use in all types of industries. Sketches of trolleys, cranes, switches, track and auxiliary equipment show construction, safety features, electrical advantages. Book also discusses engineering services offered. The American Monorail Co.

202 Handling Equipment Ordering Book—Ninety-pp Catalog 23 describes company's power trucks, power jacks, stackers and cranes, hand trucks, platforms and storage racks, and related equipment. Fully illustrated with photos and drawings it includes specifications, capacities, sizes, applications. Lewis-Shepard Products Inc.

203 Handling and Processing Equipment—Catalog 791, 32 pp, presents line of feeders, bin valves and level indicators, reduction machinery, vibrating screens and processing equipment, magnetic separators, elevating and conveying machinery, barrel packers, electrical controls for vibrating units, also chains and transmission machinery. Illustrated with photos and sketches of units and installations. Gives typical applications and advantages of equipment. The Jeffrey Mfg. Co.

204 Conveying Systems Manual—Unloading and conveying of dry pulverized material are discussed in 24-pp Bulletin FK-25. Text covers complete system and its operation, also stationary pump and related equipment and is illustrated by photos and dimensional drawings, with sizes listed. Several installations of conveying equipment are described, pictured. Fuller Co.

205 Manual on Electric Hoists—Catalog H-46, 44 pp, covers monorail and stationary hoists and car pullers and provides helpful information on fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, types of controls and factors to be considered before ordering. Contains full specifications and dimensional data, illustrations of models, many photos of installations. American Engineering Co.

206 For Overhead Moving Jobs—This is a booklet of engineering and application data on company's tramrail equipment. In addition to discussing what this equipment can do toward increasing a plant's handling methods, it illustrates and describes in detail the system's rail and arch design, switches, cranes and transfer bridges, hand operated carriers, hoists, cranes, buckets and grabs. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

207 Manual on Overhead Conveying Systems—This comprehensive handbook, Conveying Manual A-86 contains more than 200 pp of information from manufacturer's catalogs on overhead track systems and conveying equipment. Book is generously illustrated with photos of equipment, installation and construction details, and it provides full engineering and application data as well as complete catalog listings of equipment. Richards-Wilcox Mfg. Co.

CONSTRUCTION

208 Roofing Manual—Full engineering data on manufacturer's roofing and their use is presented in Specifications 50, 36 pp. Covers not only coal tar pitch roofings, but also waterproofings, roof insulations, flashings, protective coatings. Includes illustrated instructions for the roofing of most types of roof construction, including methods of handling special conditions, amount of material required. Tar Products Div., Koppers Co., Inc.

209 Technical Data on Plexiglas—This is a file folder of technical and application information on Plexiglas sheets, rods and molding powders, covering their workability, physical properties, available thicknesses. Includes data sheets on the uses and advantages of Plexiglas in large area lighting, typical designs of coffers, photos of installations and a discussion of room lighting. Rohm & Haas Co.

210 Filtered Daylight—Booklet BRA 3-0749 FSR explains how the filtering of sun's rays by means of windows and skylights made of a special heat-excluding glass can provide better light and increased comfort and other benefits. Illustrated with photos of several installations, it includes suggestions on selecting the proper type of this glass for individual plant requirements. Blue Ridge Glass Corp., Libbey-Owens-Ford Glass Co.

211 Hard Boards of Many Uses—This attractively illustrated 24-pp booklet is devoted to company's Presdwood and pictures many of the ways it is being used. Discusses its manufacture and adaptability and describes several available types for exterior and interior applications, giving physical properties of each type. Gives finish specifications and explains and illustrates edge and surface cutting, bending and finishing. Masonite Corp.

212 Steel Grating and Treads—Bulletin 2296, 24 pp explains and illustrates the major advantages of manufacturer's "Elec-

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AUTOMATICALLY SAFE. Limit switch automatic control prevents even a loaded Adjust-A-Dock from dropping if truck should move away. When not in use, Adjust-A-Docks are leveled with dock floor and sustain loads up to 400 pounds per square foot.

EASILY INSTALLED. Adjust-A-Dock installations, designed to withstand weather, are made completely above ground and have a 100% salvage value in event they are moved.

ADJUST-A-DOCK users have reported important savings in dock space, loading time, labor, handling time and damage. These savings, in many cases, paid for their entire Adjust-A-Dock installations in less than 30 days.

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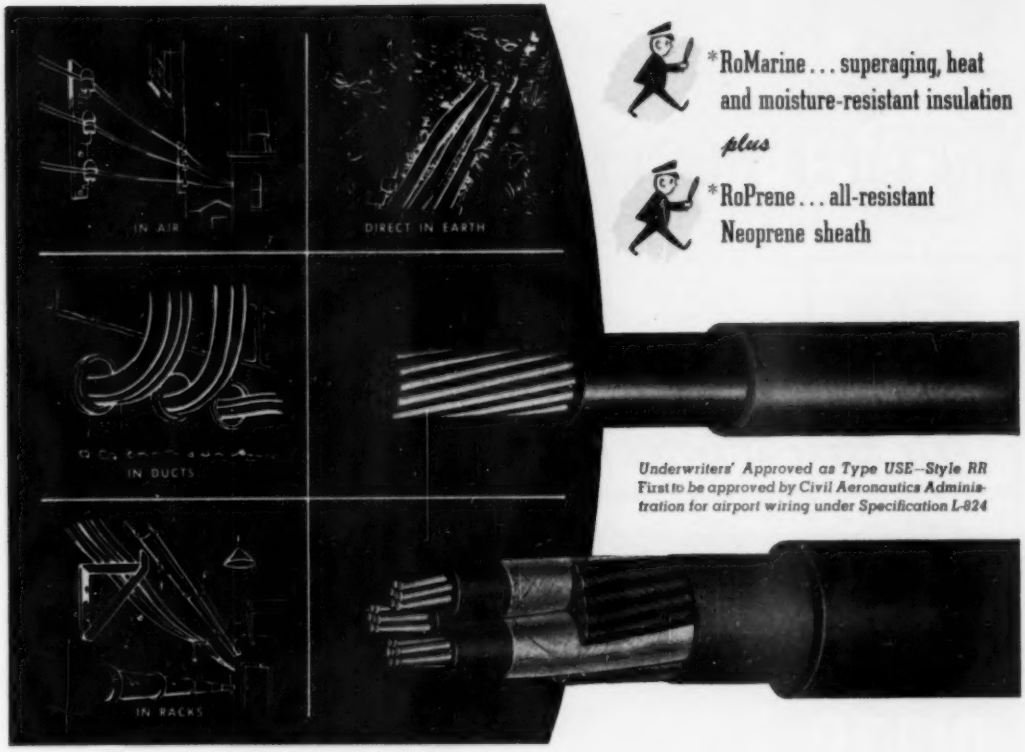
WRITE FOR COMPLETE INFORMATION ON ALL MODELS NO OBLIGATION, OF COURSE.

You get Double* Protection

with RoMarine - RoPrene



*RoMarine... superaging, heat and moisture-resistant insulation

plus

*RoPrene... all-resistant Neoprene sheath

Underwriters' Approved as Type USE—Style RR
First to be approved by Civil Aeronautics Administration for airport wiring under Specification L-824

RoMarine-RoPrene enjoys its high popularity as a dependable power cable with good reason. It offers *double protection* against circuit failures. First, its RoMarine insulation is both heat and moisture resistant. Second, its RoPrene sheath is highly resistant to oils, acids, corrosive fumes and flame. It is unaffected by electrolysis, weather hazards or extreme temperature change.

Add to this, versatility of application and you can understand why more and more utilities and industrials are swinging to RoMarine-RoPrene, the all-purpose cable. Installed direct in earth, in conduit, in air, or in runs combining all three, RoMarine-RoPrene is ideal for secondary networks, underground entrances, street lighting, station control circuits, or general purpose wiring. It is cheaper than lead sheathed cable. It is lighter ... easier to handle and splice ... Write for Specification RR-1 for test data and construction details.

It Costs Less to Buy the Best... Buy Rome Cable

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Please send me Specification RR-1 (Test Data).

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From Bar to Finished Wire

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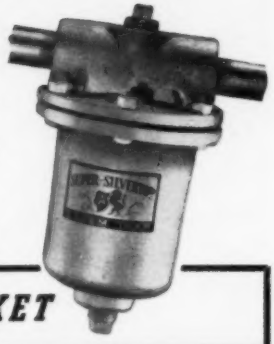
TIME
TO EQUIP
UNIT HEATERS
with SUPER-SILVERTOP *steam traps*



Winter is just around the corner. That means it's time to equip unit heaters with Super-Silvertop steam traps. Super-Silvertops pay for themselves by making unit heaters give out more heat at less fuel cost. By keeping out all water, Super-Silvertops permit the coils to be completely filled with hot dry air. Super-Silvertops work when other traps fail because they're *activated by water only regardless of temperature.* For an economical, warm winter, order Super-Silvertops installed on every unit heater today. See your representative or write us direct.

THE V. D. ANDERSON COMPANY
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Only Super-Silvertop has a GUIDED BUCKET

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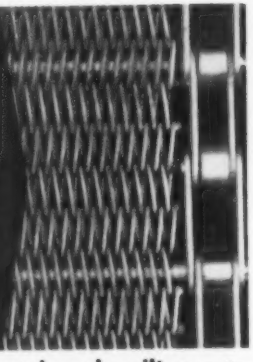

step up production – cut down handling costs

Faster, uninterrupted production . . . in heat treatment of metals, glass and ceramics; and in processing of foods, rubber, textiles, veneers and numerous other products . . . is assured with dependable, long-wearing Wissco Belts.

Fabricated in special weaves and alloys—with or without chain edges—Wissco Metal Processing Belts have high resistance to corrosion, abrasion and temperature extremes.

Write for illustrated booklet describing the many uses and cost-cutting advantages of Wissco Belts.

WISSCO METAL PROCESSING BELTS CF&I

A PRODUCT OF WICKWIRE SPENCER STEEL DIVISION OF THE COLORADO FUEL & IRON CORPORATION

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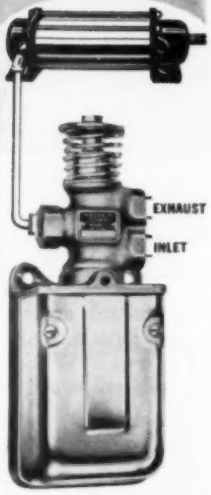

. . . and its dependability is due to many quality features. *Examples*: the "O-U" packer, no metal seats, heavy solenoid and standard pipe area through valve, permitting unrestricted air flow and preventing pressure loss. Yet Valvairs cost no more.

For use with air, water or oil pressures up to 175 p. s. i.; temperatures up to 120° F. 2-way; piped exhaust — 3-way, 4-way. Also in knob, lever, cam, clevis, foot, treadle, cylinder, diaphragm types.

Sizes: ¼", ⅜", ½", ¾", 1".

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Rely Upon Valvair — 2-WAY — 3-WAY — 4-WAY

troforged" steel grating and treads, picturing many installations. Also includes sizes, specifications, safe load data. Blaw-Knox Div., Blaw-Knox Co.

213 Building Panel Engineering Data—This is an excellent 40-pp reference book on the use of stee, and aluminum building panels for walls, decks and roofs, covering their applications, advantages and method of installation. Includes chapters on acoustically treated panels, panel fire resistance ratings, panel electrification, acoustic roofs, reinforcing floor forms. Provides selection data, dimensions, specifications. Book is generously illustrated. Detroit Steel Products Co.

214 Roofing Sheet Application Data—This is a compilation of basic data on Monel roofing sheet. Covers uses, characteristics, and properties, installation, cost, availability. Includes instructions on how to specify and table of theoretical weights of roofing sheet in available gages. Other tabular material presents suggested gages for use as roofing, wall flashings, leaders, cornices, other applications. The International Nickel Co., Inc.

215 Concrete Flooring—How a heavy-duty industrial flooring is intended to meet production needs and solve special problems is explained in Bulletin 601. Stresses durability of this emery aggregate concrete flooring, citing tests results and listing its advantages. Twelve installations are pictured. Walter Maguire Co., Inc.

MAINTENANCE

216 Industrial Products for Maintenance and Construction—This catalog is a comprehensive collection of data sheets on company's line of industrial products. It gives product descriptions, specifications and directions for use. Covers heavy duty mastic floorings, asphalt protective coatings, waterproofing and dampproofing materials, resilient floor covering underlayments, industrial adhesives and cementing. The Flintkote Co.

217 Building Maintenance Manual—Sixty-four-pp Handbook 7 is packed with useful information on the applications of an extensive line of floor surfacings and other maintenance products, as well as leak stoppers, external wall sealants, road patching, roofing materials. Illustrated throughout with photos and sketches it provides complete product information and step-by-step instructions for use. Shows how to analyze problem, select right product, estimate quantity needed and carry out the work. Flexrock Co.

218 Protective Surfacing—Bulletin 15'0 presents specifications and characteristics of company's silicone coating aluminum, telling some of its uses and advantages. Also discusses surface preparation, coverage. The Dampney Co. of America.

219 Painting with Aluminum—Form Ad-228 is a comprehensive 32-pp brochure, filled with factual information for all industrial users of aluminum paint. Basically, it explains how aluminum paints can be used to best advantage. It emphasizes that uses of aluminum paint by industry fall into three classifications: 1) for metal, concrete and masonry and other non-absorbent surfaces; 2) for weather exposed wood, and 3) for interior heated surfaces and decorative uses. Aluminum Co. of America.

220 Iron Cement Handbook—This pocket-sized 40-pp catalog on company's iron cements for repair work and other applications is filled with valuable suggestions for plant engineers. It discusses 10 different products and gives general tips on mixing and applying them. More important, it provides illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

221 Valve Maintenance Guide—"Prevent Valve Failure Before It Starts," is an excellent 28-pp text covering the selection, installation and inspection of valves, as well as their maintenance. Fully illustrated, it includes many photos of damaged valves with explanations of what caused the damage and how it could have been prevented. It discusses maintenance schedules, what to look for on inspection jobs, the value of training maintenance

WeldOlets, Butt Welding — Available as standard, with outlet sizes from ⅛" to 24", both straight and reducing for use with Schedule 40 pipe up to 12" outlet. Outlet sizes 12" - 24" for standard weight pipe (⅜" wall). Also available for Schedule 80 services through 8" outlet and extra strong through 24" outlet size (for use with pipe having ½" wall).

You write ... SPEED, ECONOMY AND FULL PIPE STRENGTH into the job when you specify WELDOLETS

With WeldOlet branch pipe welding fittings you provide the quickest, most economical, most satisfactory method of obtaining full pipe strength at branch connections.

Note in the above illustration how the WeldOlet tapers to provide a single bevel groove joint at the crotch section and blends into a V-butt joint at the ear portion.

WeldOlets need no additional reinforcement to establish and fully maintain original strength on ASTM A-106 Seamless Steel Grade A Pipe, as set forth in Code for Pressure Piping, American Standards Association, B31.1-1942, and Supp. No. 2, B31.1-b-1947.

To meet special conditions, these fittings can be furnished in any forgeable metal including wrought iron, toncan iron, nickel, Monel, Everdur, stainless grades 304, 316, 347, etc.

For detailed engineering reference data, write for Catalog W-2.

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FOR WELDED BRANCH PIPE OUTLETS

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ThredOlets — Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedule 80 up through 2" outlet size.

Fig. 1—Cut-away view of reducing size WeldOlet with welding outlet in place. The external rib and wide bases or footings of WeldOlets eliminate the need for extra supports to take care of bending or vibrational stresses at crotch section, the point of greatest stress.

Fig. 2—Note blending of ear portion of welding fitting to run pipe. Extension of weld metal below inside scarfed portion of pipe insures all sections of joint greater than pipe wall thickness.

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No wasted time, *no wasted steam*, where Stickle Steam Traps are on the job! Applied to your heating and processing equipment, Stickle Traps discharge air and non-condensable gases quickly and economically—save fuel, save steam, *save money!*

Both strainer and by-pass are built into the Stickle Trap, cutting your costs from the very start. Just a quarter turn of nut in trap top permits trap to by-pass. Nut is part of valve seat, located in top of trap to cut down costly scale interference. Valve connects with Open Float Bucket by friction-free rod; *rotates and automatically regrinds valve* as trap discharges, preventing wire-drawing. No levers, hinges or pins to repair or replace. No thermal elements or diaphragms. Just a durable, space-saving, dependable trap, designed to handle maximum volume of condensate at lowest cost. Let the *60-day guarantee* prove it to you in *your* plant! Write for *free* Bulletin 115.

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- *Straight-in-line installation*
- *Positive, automatic operation*
- *Self-regrinding valve and seat*
- *Open bucket float*
- *Internal strainer*
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- *4 sizes: 500 to 3000 pounds per hour*
- *Operates at pressures from 1 to 250 lbs. depending on sizes*
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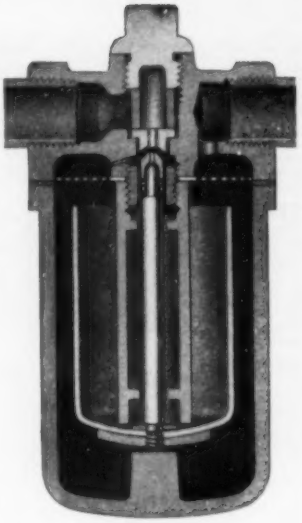

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Anyone can brush, trowel or spray NoDrip on any clean, dry surface. Goes on like plaster, forms a seamless, protective coating. **Stops condensation drip.** NoDrip keeps equipment and floors safe and dry; prevents corrosion of metal and prolongs its life. Acid, alkali and brine resistant. Comes in 1, 5 and 55 gal. drums, ready for use.

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Apply NoDrip to a small area, compare the results with uncovered portion.

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IS TAMPER-PROOF

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Stoutly constructed of steel wire, heavily galvanized, Realock Fence is weather-resistant, extra durable and practically maintenance free. The Wickwire Division will not furnish integral arms as shown, but will substitute a malleable base with pressed steel arms. For complete details refer to Sweet's Catalog. For free estimate consult your classified telephone directory — or write direct.

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personnel in correct procedures. Also covers lubrication, pipe line checking, proper threading, regrinding, disc replacement. Jenkins Bros.

222 Turbine Repairs—Vol. 5, No. 1 of Metco News tells of the economy of metallizing in turbine repair work, citing several case histories in which savings were effected by this method. Illustrates several examples of turbine repair jobs. Metallizing Engineering Co., Inc.

223 For Overhead Maintenance Jobs—Here is an illustrated specification sheet on company's hydraulically raised rolling maintenance tower engineered for one-person operation. Tells where unit is profitably used and how it's built to clear doorways. Discusses operation and structural details. Safway Steel Products, Inc.

224 Drip Preventive Handbook—The insulation of pipelines, tanks, cold air conditioning ducts, and wall surfaces against corrosion and condensation drip is covered in this pocket-size, 32-pp handbook, Form F-17. Describes an insulation coating and its applications and tells how to prepare surfaces for it and apply it. Photos illustrate these instructions and show coating in use. Technical data includes tables showing pipe and tank surface coverage and humidity charts. J. W. Mortell Co.

225 Adjustable Scaffolds—Lightweight aluminum alloy scaffolds with adjustable legs and "built-in" safety factors—locking casters, platform railings, platform support braces, increased strength—are described and illustrated by photo in this bulletin. Shows how easily scaffolds are carried and erected and how they are adaptable to many maintenance jobs. Up-Right Scaffolds Div., Up-Right, Inc.

ELECTRICAL

226 Motor Handbook—Bulletin MU-183 is a collection of more than 60 pp of engineering and descriptive data on company's line of motors. Covers many types, including splash-proof and explosion proof motors, gear motors and motors intended for use in chemical plants, for oil well pumping, punch press motors, elevator, crane and hoist motors. Illustrated throughout; includes price lists. Wagner Electric Corp.

227 Voltage Control—Bulletin 547, covering variable transformers and voltage regulators, illustrates and describes available models, stressing their special features and including specifications, dimensional data, ratings and connection arrangements. Also presents electronic electro-mechanical regulators. Includes price list. The Superior Electric Co.

228 Selenium Rectifiers—Booklet DB-19-025 on standard and high-voltage selenium rectifiers for power supplies and electronic circuits gives efficiency curves for both types, together with discussions on efficiency and service life, back leakage and reverse resistance and forward resistance. Life characteristics of both cell types for various overload conditions or high ambient temperatures are plotted graphically. Westinghouse Electric Corp.

229 Power Distribution Feeders—Catalog TEB-1, 40 pp, is devoted to heavy-duty units used as main feeders in company's power distribution system, giving construction details, engineering data, application tips. Includes comparative analysis between this and other methods of power distribution on basis of cost and performance. Also contains full listing of parts. The Trumbull Electric Mfg. Co.

230 Precision Switches—Catalog 81, 20 pp, covers industrial switches for a-c circuits. Describes and illustrates general purpose basic switches, reset basic switches, auxiliary actuators, enclosed switches, explosion-proof and splash-proof types, limit switches and extra small switches. Includes full ordering information, technical data and definitions, price list and discount schedule. Micro Switch.

231 Answer Card—Rules of thumb for answering questions on capacities and appiying power-factor-improvement are printed on a double card small enough to fit in plant engineer's wallet. With this card he can quickly compute the answers to the questions: How many kilovars? What power factor? How much voltage rise? Diagrams illustrate formula. Apparatus Dept., General Electric Co.

232 Selector Switch Data—Here is an engineering data folder complete with target sheet to aid plant engineers in understanding and applying company's push-pull-selector switch. Features detailed illustrations, description and typical applications. Explains in detail how switch provides a single master control that will serve eight to 16 operations by pulling the handle to start, pushing to stop. The Arrow-Hart & Hegeman Electric Co.

233 Power Distribution Cable—Bulletin RR-1 describes an economical, easily installed, multi-purpose cable offering superaging, heat and moisture resistant insulation as well as a Neoprene sheath. Illustrates construction of cable, touches on its advantages and provides full specifications and engineering data. Rome Cable Corp.

234 Motors for the Dirty Jobs—Totally enclosed, fan-cooled motors are described in Bulletin SL-300-2A. Illustrates and explains how these motors are built to run cooler and stay cleaner, especially in dirty atmospheres. Includes complete dimensional and ordering data. Pictures several of these motors at work on machine tools, carding machines, acid pumps. Crocker-Wheeler Electric Mfg. Co., Div., Elliott Co.

235 Electrical Diagram Guide—The purpose and use of electrical diagrams supplied with switchgear equipment are explained in Bulletin GET 1293A. It was written to help those who install, operate or maintain switchgear equipment make the best use of the diagrams that come with such equipment. Discusses in detail

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Telescopic Straddle Type GO-GETTER tiering 48" x 48" pallets in narrow aisle of prominent food warehouse.

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Hilco-Lustre dries hard and bright . . . and non-slippery . . . Quickly—Permanently. It's a tough topcoat that protects the floor . . . stands up against traffic . . . is self-polishing. It's the ideal floor treatment for industrial plants of all types, where safe floors pay off in fewer accidents.

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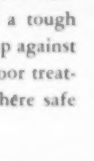
Call Hillyard's trained floor Maintaineer for consultation. He gives expert help . . . makes no charge for his services.



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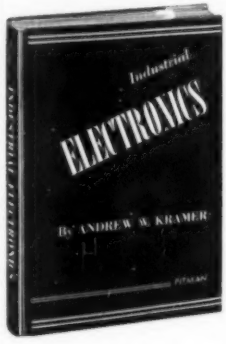

INDUSTRIAL ELECTRONICS

by Andrew W. Kramer, Editor, Power Generation

This new book explains in clear, simple, non-technical style the basic principles of electronics, and how these principles can be applied in industry. Electronics has been solving the unsolved problems. Whether it is navy beans, opening doors at a shadow, or measuring the thickness of red-hot steel plates, the electron is the newest and most efficient force captured by science. This book should be invaluable for the practical maintenance or operating executive or engineer. 311 pages, 229 illustrations, $6.00.

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one-line, elementary, connection and interconnection diagrams. It tells their scope and uses and illustrates symbols used and common variations, and explains ASA device function numbers, conventions. General Electric Co.

236 Distribution Duct Engineering Data—Bulletin 427-4 contains 32 pp of dimensional data for estimating ventilated duct for feeder circuits, plug-in duct, and plug-in duct for branch circuits. Illustrated throughout, the book also contains useful information on bus duct, instructions for laying out distribution duct jobs and pointers on estimating. Two pp are devoted to diagrams and symbols used in layouts. BullDog Electric Products Co.

237 Manual of System Planning, Preventive Maintenance—This 50-pp book covers complete story of electrical system planning and maintenance. Covers system functions; code reference chart; voltage drop tables; power factor charts; guides for motor wiring; guides for lighting wiring; electrical system records; supplementary feeder schedule; preparing electrical plans; switchboard and feeder schedule; riser diagram of complete system; motor and control schedule; symbols for wiring plans. Anaconda Wire & Cable Co.

238 Power Circuit Transformers—A handy ordering table is included in Folder C-15 on dry type power circuit transformers. Transformers from 50 to 15,000 va capacity are cataloged. A typical wiring diagram showing use of higher voltage circuits is included. Jefferson Electric Co.

PIPING, TRAPS, STEAM ACCESSORIES

239 Steam Trap Manual—"Solving Steam Trap Problems," 36 pp, covers correct trapping practice for unit heaters, jacketed kettles, autoclaves, submerged surfaces, hospital, kitchen and laundry equipment, steam mains, header drips etc. Tells how to select size and determine lift of trap. Explains theory, operation, maintenance; gives details of simplified piping for steam traps. Also discusses float traps, air release valves and pipe line strainers. Specifications, capacities and some prices are given. The V. D. Anderson Co.

240 Steam Hook-Ups—This is the 64-pp sixth edition of company's excellent manual on hook-ups for steam traps, air vents and industrial temperature controls. In addition to hook-up diagrams, much helpful technical information is provided covering calculations for steam trap sizes, selection data on traps and regulators, properties of saturated steam, flange standard dimensions, standard pipe and pipe threads. Includes photos and brief discussions of several traps, strainers and other equipment. Sarco Co., Inc.

241 Steam Traps—Bulletin 315 presents company's smaller steam traps designed for greater performance capacities. Illustrates and explains their design and operation, tabulates sizes and capacities and includes prices of traps and accessories. Also describes briefly and illustrates a differential drainage and boiler return system. Stickle Steam Specialties Co.

242 Steam Separators—Bulletin S-14-C, presents line of separators for removing unwanted elements from steam, air and other vapors. It is profusely illustrated with photos, diagrams and line drawings, gives full specifications, selection and ordering data on company's helio-centrifugal separators of both vertical and horizontal types. The Swartwout Co.

243 Steam, Air, and Gasoline Traps—Illustrated Catalog 250, 32 pp, describes several thermostatic steam traps for pressures to 225 lb; expansion steam traps for pressures to 250 lb; weight-operated traps for steam, air, gasoline pressures to 1500 lb; piston-operated steam traps for pressures to 650 lb; also steam, air and gas separators. Complete with capacity tables, installation diagrams, discussion of typical applications, a section containing data, charts and formulas for determining proper size trap. W. H. Nicholson & Co.

244 All-Service Separators—Bulletin 2950 tells advantages of company's all-purpose

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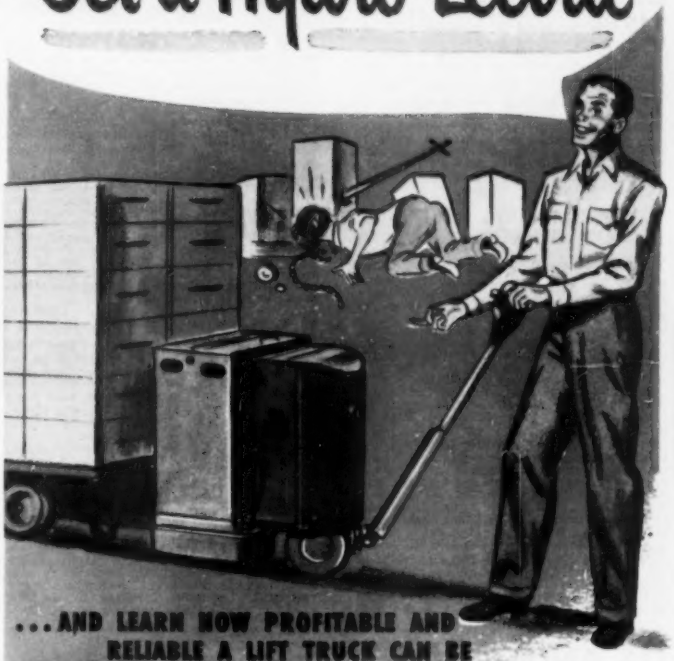

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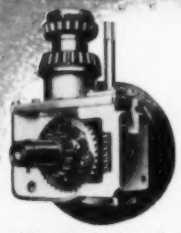

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separators for use on both horizontal and vertical lines as well as separator built particularly for comparatively low steam pressures. Explains and illustrates how separators act to remove oil or water from steam or air lines. Includes dimensions, list prices as well as data on drainage units. Cochrane Corp.

245 Strainer Data By Request—In response to demand for a former publication on pipeline strainers, this revised edition, Bulletin S-203, contains greater and more up-to-date data on the screwed strainers as well as expanded details on the flanged types. Fully illustrated with photos of the strainers and screens used in them, it explains function of the strainers and provides material specifications, pressure and temperature data, dimensions and prices. Also includes suggestions for installing strainers and replacing screens. Yarnall-Waring Co.

MECHANICAL POWER TRANSMISSION

246 Chain Drive Manual—Catalog SCE-50, 68 pp, provides data on company's silent chain drives, giving their advantages, recommended applications. Also gives information on chain length calculation, installation and maintenance, dimensions, ratings, prices. Actual-size photos illustrate chain types, pitch. Includes full ordering data on sprockets.

Catalog CR-48, 16 pp, contains similar information on company's roller chain drives. Both books are available; ask for either or both. Whitney Chain & Mfg. Co.

247 Gear-Type Coupling—Bulletin 101 tells why company's gear type coupling can provide reduced maintenance and long-run economy when used with gas blowers, turbine driven pumps, mills, compressors. Stresses couplings' flexibility and illustrates 16 basic designs. Fast's Coupling Dept., Koppers Co., Inc.

248 Steel Shaft Data—Bulletin G-7, 20 pp, originally compiled for use by company's own engineers, contains formulas, curves and tables that will materially assist in determining proportions, stresses, combined torsional and bending loads in round, square, hollow, keyway and stepped shafts. Also includes photos showing production of company's worm gearing. IMO-DeLaval Products Div., DeLaval Steam Turbine Co.

INSTRUMENTS AND CONTROLS

249 Self-Operating Regulator—Bulletin 329 contains information on a regulator for use on water and oil heaters, crude oil treaters, tanks, vats and other processing equipment. Includes tables helpful in selecting the proper size regulator and illustrates the broad scope of automatic control. Also contains layout drawings of several applications. The Powers Regulator Co.

250 Laboratory Thermometers—Chemical thermometers, low temperature thermometers, laboratory thermometer sets, calorimeter and differential thermometers and special test thermometers for various applications are pictured and described in Bulletin C, 24 pp. Gives specifications, ranges and sizes and explains use of instruments. Also includes nomograph for emergent stem correction. Precision Thermometer & Instrument Co.

PUMPS

251 Pump Catalog—Turbine type and centrifugal pumps for a wide range of industrial pumping jobs are described and illustrated in this booklet. Includes specifications, on all types cataloged, tells their special features and where to use them. Aurora Pump Co.

252 Centrifugal Pump Care—Sixteen-pp Bulletin 06X6256A is a revised handbook on the care of all makes of centrifugal pumps, giving the how and why of pump construction and their effect on pump maintenance. This informative booklet tells how to figure head and it carries tables to help determine friction loss. Causes and cures for various sources of troubles are offered along with a new maintenance timetable. Also discusses how to protect pumps against cavitation, water as a pump lubricant, common mistakes in packing stuffing boxes. Allis-Chalmers Mfg. Co.

253 General Service Pumps—Bulletin 30, covering company's helical gear pump, explains its "progressing cavity" principle of operation and lists some of the wide variety of materials this pump is designed to handle. Dimensions, speeds, capacity information and other data are included for both standard type and tubular type for higher pressures, greater resistance to abrasion. Pump Div., Robbins & Meyers, Inc.

254 Centrifugal Pumps—Bulletin W-318-821 on two-stage double suction centrifugal pumps for pipe lines, boiler feed, general water service and other applications, illustrates their design and construction and discusses their important features. Includes dimensions and selection chart. Worthington Pump and Machinery Corp.

VALVES

255 Bonnet Valves—Company's "Pressure-Seal" bonnet valves are described and illustrated by photos and cutaway drawings in Form AD-1819. Includes sizes dimensions, ratings and tests for gate, globe, angle and stop check valves as recommended for high pressure and high temperature service. Also explains operating advantages of the valves and tells how the pressure seal is made. Photos of several installations included. Crane Co.

256 Reducing Valve Engineering Data—Bulletin 962 presents data on pressure reducing valve, explaining how its streamlined contour contributes to efficiency of performance. Discusses and illustrates valve's straight-line flow, wide opening, tight closing and other design features. A. W. Cash Co.

257 Control Equipment—General Catalog 001, 30 pp, is devoted to measuring and control equipment for water and sewage works, power and processing industries. Catalog illustrates and describes in detail: venturi tubes and meters, controllers, gages, manometers, pilot equipment. Includes capacity tables, dimensional data, specifications, layout drawings. Simplex Valve and Meter Co.

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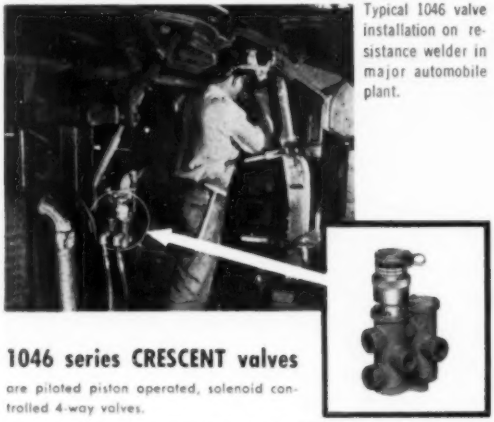

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258 General Service Valves—Bulletin E-160, 16 pp, describes and illustrates the design and construction of company's quick-operating valves, explaining their application to blow-off service and on fire protection, chemical process, soot blower, water column blow-down, and other types of pipe lines. Included are tables of dimensions, weights and list prices. Everlasting Valve Co.

AIR CONDITIONING, HUMIDIFYING

259 How Conditioning Units Can Help—The advantages of self-contained conditioning units in cooling, dehumidifying and cleaning are given in illustrated Catalog 1307, 40 pp. Explains installation and operation. Includes complete engineering data on direct expansion cooling, cold water cooling, hot water heating, steam heating. Also includes speed and horsepower tables, dimensional data on both horizontal and vertical types, pyschometric chart and typical problems involving choice of unit size, number of rows of coils, determining speed and motor horsepower. Clarage Fan Co.

260 Humidifiers—Illustrated Bulletin 1772 covers line of steam humidifiers, including two new air-conditioned models. Includes discussion of dry air problems, tables on desirable relative humidities and regain of hygroscopic materials, complete data on operation and installation of both electric and air-controlled types. Also tells how to select humidifiers, giving capacities, prices. Armstrong Machine Works.

TOOLS, WELDING

261 Pipe Tools, All Kinds—Catalog 50, 36 pp, covers entire line of pipe tools, machines, power drives, threading oil. Products are illustrated by photo and operational advantages fully explained. Includes concise ordering specifications, current price list. Beaver Pipe Tools, Inc.

262 Tool Catalog—Company's complete line of hand and power tools, tool sets, kits and related equipment is presented in Catalog T, 110 pp. Illustrated with photos of all items listed, it describes tools, includes sizes, applications, shipping weights. Snap-On Tools Corp.

263 Welding Electrode Ordering Guide—Here's a handy pocket-size booklet, Catalog R7-7, filled with information covering electrodes for hard surfacing and for welding stainless steels, alloy steels and mild steels. Includes operating characteristics, sizes, current ranges, tensile strengths, polarity. Harnischfeger Corp.

264 Welding Outlets—Catalog and Engineering Reference Book W-2 presents company's line of welding, threaded and socket outlets and tank flanges. In addition to full ordering information, it includes a general description of the various outlets, discusses their advantages and provides illustrated instructions for installing them. Includes temperature-pressure ratings and material specifications, photos of installations. Bonney Forge & Tool Works.

FITTINGS AND FLANGES

265 Tube Fittings Selection Guide—Bulletin 342A contains at-a-glance factual data on brass fittings for use with copper, aluminum, brass, steel and other metal tubing. Provides—in tabular form—assembly and cut section views of several fittings, an explanation of methods of assembly, tubing for which fitting is suited, size range, applications and advantages, as well as illustrations of stock types available. The Imperial Brass Mfg. Co.

266 Handbook on Fittings and Flanges—Catalog wf-1950, 88 pp, is packed with working information on manufacturer's seamless carbon steel welding fittings and forged steel flanges. In addition to presenting standard schedules with their specifications, list prices and sizes, this book gives information on dimensional tolerances; American standards flange facings with dimensions; thread standards and threading practice; service pressure ratings, physical and chemical requirements for flanges, nuts and bolts; plus sizes and wall thicknesses of welding fittings stocked. Grinnell Co., Inc.

OTHER EQUIPMENT

267 Four Handy Guides for Plant Engineers—Bulletin 20B 6051J, 12 pp, offers data on figuring V-belt drives; Bulletin 51B 6025K, 12 pp, for quick selection of electric motors; Bulletin 52B 6059E, 16 pp, for selection of centrifugal pumps, and Bulletin 25B 6150B, 32 pp, for a description of equipment for power generation, distribution and control. Any or all of these booklets are available—specify those wanted. Allis-Chalmers Mfg. Co.

268 Rubber Products Reference Book—This is a collection of data covering all types of hose, belting, packing and other rubber products manufactured by company, including work gloves and helmets, linings, and hard rubber items. Fully illustrated, provides descriptions, specifications, recommended applications. The B. F. Goodrich Co.

269 Shock Absorbers for Machines—This folder describes and illustrates a vibration isolating and shock absorbing material recommended for use as machine mounting or as component parts. Explains how material functions and how it is installed. Fabreeka Products Co.

270 Modern Steam Engines—In presenting steam engines as more than "just drives," Bulletin 306 touches briefly upon some of the advantages of "by-product" power. Bulletin features company's vertical steam engines of both throttling and automatic governor types. Sectional drawings are accompanied by engineering data, an illustrated discussion of construction features and photos of installations. Troy Engine & Machine Co.

271 Welding Fume Collectors—Bulletin 37-D describes and illustrates fume collecting equipment for welding operations. Discusses advantages of collecting fumes at the source, hood protection, good working range, easy installation. Illustrates regular, long-reach and special collectors, giving dimensions and application information. Also describes ventilated welding cabinet. Ruemelin Mfg. Co.

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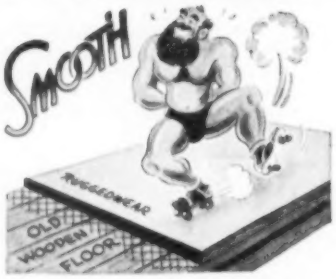

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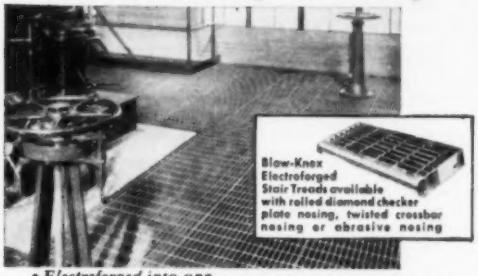
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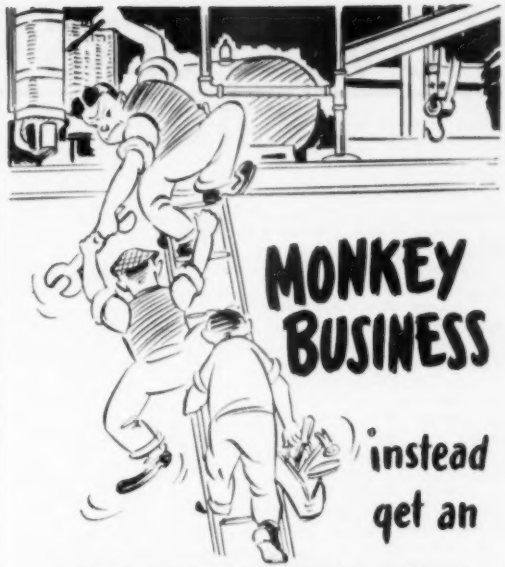

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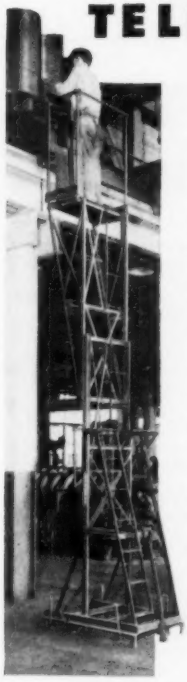

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272 Vacuum of Many Jobs—Bulletin 144, 20 pp, describes and illustrates 132 unusual industrial uses for company's vacuum system. Applications, listed alphabetically, range from the removal of dust from inside of rolls of adhesive tape to recovery of zinc dust. The Spencer Turbine Co.

273 Planned Industrial Lighting — A manual of lighting application data, 36-pp Bulletin 1d contains a seven-step simplified procedure for laying out a lighting installation according to the lumen method. Explains benefits of planned industrial lighting and includes a buyers' guide to quality lighting, also a table on maintenance "trouble shooting." In addition, there are layout suggestions, coefficients of utilization, short-cut footcandle tables on lighting equipment and many valuable lighting tips. Benjamin Electric Co.

274 The Why, What and How of Lubricants—Here's a 20-pp booklet explaining the commonly used tests and terms describing lubricants. Covers viscosity, flash and fire, neutralization number, penetration, specific gravity, extreme pressure, steam emulsion, corrosion. Includes glossary of 100 lubrication terms and lists products manufactured by company. Although factual, book is written in layman's language and illustrated with drawings showing the various tests as well as amusing sketches which interpret their meanings. Tide Water Associated Oil Co.

275 Metal and Asbestos Gaskets — This 32-pp catalog covers company's stock gaskets of all types as well as gaskets fabricated to specifications. Illustrated with photos, it includes full specifications, dimensions, application data. Also contains engineering data helpful in estimating gasketing needed. United States Gasket Co.

276 Reference Bibliography on Chemical Proportioning—Bulletin CAT lists more than 50 bulletins and reprints of articles published by manufacturer on the general subject of constant rate and flow responsive proportioning. Covers equipment, methods, uses. % Proportioneers, Inc. %

277 Viscosity of Fluids—The larger significance of viscosity is discussed in Nos. 5 and 6, Vol. 36 of Lubrication, a technical publication. In six parts, the first illustrates the simplest conception of streamline flow between two surfaces having relative motion. A series of torsion viscometers show how viscosity acts and may be measured. Part II covers streamline flow in capillary and other small tubes. Part III covers turbulent flow usually encountered in pipes. Part IV discusses effects of temperature and pressure on viscosity, and Part V includes viscosity index. Part VI gives a brief reference to the nature of plastic flow. The Texas Co.

278 Underfeed Stokers—Manufacturer's underfeed stokers for loads from 100 to 360 developed hp, and those designed to carry loads up to maximum usually required of a single retort, ram type, side dump underfeed stoker, are presented in Bulletin SB 27. Illustrates, by photos, and explains construction and design details; gives dimensions. Erie City Iron Works.

279 Plant-Wide Water Service—Titled, "Let's Consider Your Whole Water Problem," this booklet analyzes water problems from four standpoints—procurement, treatment, usage and disposal—and explains how company is prepared to offer technical service in solving problems related to all four. Hall Laboratories, Inc.

280 Floor Care Booklet—The problem of safety and polished floors is presented in an illustrated booklet called, "Mr. Higby Learned About Floor Safety the Hard Way." It suggests methods by which floors can be polished and still be safe and how housekeeping costs can be cut. Walter G. Legge Co., Inc.

282 Walkways and Loading Racks — 36-pp data book filled with photos of installations and application suggestions. Part I, Section 6 of Catalog 54 presents pre-cut steel material for on-the-job erection into walkways, stairways, loading racks. Gives instructions covering the use of the units and includes layout diagrams and parts lists for the installations pictured. Black, Sivalls and Bryson, Inc.

283 Small Scaffold — The merits of a small sized swinging scaffold for painting and other light-duty work are stressed in illustrated Bulletin C.P. 34. Explains safety features, tells how scaffold is used. The Patent Scaffolding Co., Inc.

284 Technical Data on Controls, Control Valves—Technical information and solution to problems involving the use of pressure switches — or any application where it is necessary to convert pressure or vacuum changes into electrical action —are available from this company. Data also available on use of four-way solenoid valves for control of air, water and light oil in pipe sizes of ⅛, ¼, ½ and ¾ in., up to 150 psi. Barksdale Valves.

285 Steel Work Benches—Form 701 is an ordering guide for work benches, illustrating models and providing explanation of features as well as listing dimensions and specifications and available top materials. Also gives ordering data on drawer tiers, continuous benches, bench tops, parts and accessories. Standard Pressed Steel Co.

286 Phone Booths for Noisy Spots—Bulletin 184 provides photos of several of company's floor and wall model phone booths designed to permit telephone conversations in factories, utility plants, commercial buildings. Stresses advantages and pictures construction. Burgess-Manning Co.

287 Plexiglas Applications—This booklet illustrates many of the ways Plexiglas is now being used. Also gives physical properties, sizes and descriptive information about this acrylic plastic in sheet and rod forms and discusses molding powders and their use. Rohm & Haas Co.

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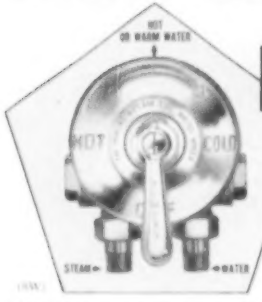

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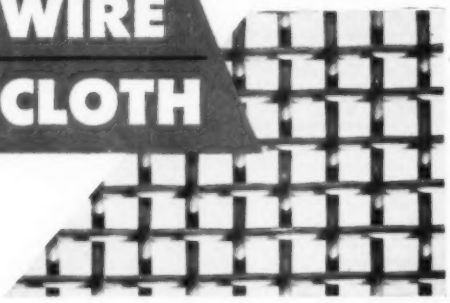

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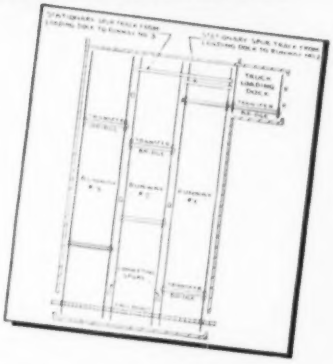

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